MIA 2022 BILBAO

X SIMPOSIO SOBRE EL MARGEN IBÉRICO ATLÁNTICO

X SIMPÓSIO SOBRE A MARGEM IBÉRICA ATLÂNTICA

LIBRO DE RESÚMENES / LIVRO DE RESUMOS / LABURPEN-LIBURUA

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UPV EHU

BILBAO 7-9 JULIO/JULHO 2022

www.ehu.eus/simposiomia2022

X SIMPOSIO SOBRE EL MARGEN IBÉRICO ATLÁNTICO
X SIMPÓSIO SOBRE A MARGEM IBÉRICA ATLÂNTICA

BILBAO, 7-9 JULIO / JULHO / UZTAILA 2022

LIBRO DE RESÚMENES
LIVRO DE RESUMOS
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El Simposio sobre el Margen Ibérico Atlántico (MIA) es una reunión científica multidisciplinar que se celebra cada 3 años. Desde la primera edición en Lisboa (1994) su organización se ha ido alternando entre Portugal y España, celebrándose posteriormente en Cádiz (1997), Faro (2000), Vigo (2003), Aveiro (2006), Oviedo (2009), Lisboa (2012), Málaga (2015) y Coimbra (2018). Durante el VIII Simposio en Málaga se aprobó la organización de su décima edición en Bilbao, que se desarrollará entre los días 7-9 de julio 2022 en el Bizkaia Aretoa (UPV/EHU).

El País Vasco presenta una larga tradición de estudios litorales y marinos. El primer trabajo sobre la costa vasca fue publicado por el geólogo francés M.E. Jacquot (1864), quien analizó con detalle los 15 km de acantilados que se extienden entre San Juan de Luz y Biarritz. Posteriormente, el buque británico HMS *Porcupine* realizó en 1869 la primera campaña oceanográfica que incluyó el estudio científico del Golfo de Bizkaia. La Sociedad de Oceanografía de Guipúzcoa (SOG) se fundó en 1908 y las primeras campañas de investigación que se ocuparon de los fondos marinos de la costa vasca fueron llevadas a cabo por los buques *Hernán Cortés* en 1924 y *Xauen* en 1932 y 1933, gracias a un convenio de colaboración entre la SOG y el Instituto Español de Oceanografía (IEO). En el año 1946, la junta directiva de la SOG propuso al biólogo José María Navaz para que se hiciera cargo del Laboratorio de la Sociedad en el Aquarium de

O Simpósio da Margem Ibérica Atlântica (MIA) é um encontro científico multidisciplinar que se realiza a cada 3 anos. Desde a primeira edição em Lisboa (1994) que a sua organização tem alternado entre Portugal e Espanha. Seguiram-se assim Cádiz (1997), Faro (2000), Vigo (2003), Aveiro (2006), Oviedo (2009), Lisboa (2012), Málaga (2015) e Coimbra (2018). Durante o VIII Simpósio MIA, em Málaga, foi aprovada a organização da sua décima edição em Bilbao, que irá decorrer de 7 a 9 de julho de 2022 na Bizkaia Aretoa (UPV/EHU).

O País Basco tem uma longa tradição de estudos costeiros e marinhos. O primeiro trabalho sobre a costa basca foi publicado em 1864 pelo geólogo francês M.E. Jacquot, que analisou detalhadamente os 15 km de arribas que se estendem entre Saint Jean de Luz e Biarritz. Posteriormente, a primeira campanha oceanográfica do navio britânico HMS *Porcupine*, realizada em 1869, incluiu o estudo científico do Golfo da Biscaia. A Sociedade de Oceanografia da Guipúzcoa (SOG) foi fundada em 1908 e as primeiras campanhas de investigação sobre o fundo do mar ao largo da costa basca foram realizadas em 1924, pelo navio *Hernán Cortés*, e em 1932 e 1933, pelo *Xauen*, graças a um acordo de colaboração entre a SOG e o Instituto Espanhol de Oceanografia (IEO). Em 1946, a Direção da SOG propôs ao biólogo José María Navaz que

"Simposio sobre el Margen Ibérico Atlántico (MIA)" hiru urtez behin egiten den diziplina anitzeko bilera zientifikoa da. Lehen edizioa Lisboan egin zen 1994an, eta, harrezkero, antolakuntza Portugalen eta Espainiaren artean txandakatuz joan da. Honako hiri hauetan egin da: Cádiz (1997), Faro (2000), Vigo (2003), Aveiro (2006), Oviedo (2009), Lisboa (2012), Málaga (2015) eta Coimbra (2018). Málagan egin zen VIII. Sinposioan, hamargarren edizioa Bilbon antolatzea onartu zen, eta 2022ko uztailaren 7tik 9ra egingo da Bizkaia Aretoan (UPV/EHU).

Euskal Herrian, aspaldidanik egiten dira itsasertzari eta itsasoari buruzko azterlanak. EHko kostaldeari buruzko lehen lana M.E. Jacquot (1864) geologo frantsesak argitaratu zuen; bada, xehe-xehe aztertu zituen Donibane Lohizuneren eta Miarritzen arteko itsaslabarrak (15 km luze dira). Gero, HMS *Porcupine* ontzi britainiarrak lehen kanpaina ozeanografikoa egin zuen 1869an, eta horren barruan sartu zen Bizkaiko Golkoaren azterketa zientifikoa. Gipuzkoako Ozeanografia Elkartea (GOE) 1908an sortu zen eta euskal kostaldeko itsas hondoei buruzko lehen ikerketa kanpainak *Hernán Cortés* ontziak (1924) eta *Xauen* ontziak (1932 eta 1933) egin zituzten, GOEren eta Espainiako Ozeanografia Institutuaren arteko lankidetza hitzarmen bati esker. 1946an, GOEko Zuzendaritza Batzordeak José María Navaz biologoa proposatu zuen elkartearen laborategiaz arduratzeko Donostiako

Donostia-San Sebastián, indicando además que su ayudante fuera Joaquín Gómez de Llarena, que contaba con una gran experiencia como geólogo especializado en sedimentos marinos. Más recientemente, el establecimiento de los estudios científicos en la Universidad de Bilbao a partir de 1971 (después Universidad del País Vasco UPV/EHU), las actividades de la Sociedad Cultural de Investigación Marina (INSUB) desde 1976, la creación del Servicio de Investigación Oceanográfica en 1982 (posteriormente denominado Instituto Tecnológico, Pesquero y Alimentario AZTI), junto con la celebración en Donostia-San Sebastián del 2º Coloquio Internacional sobre Oceanografía del Golfo de Bizkaia en 1990, han ido consolidando el desarrollo científico de esta temática.

Este X Simposio sobre el Margen Ibérico Atlántico / X Simpósio sobre a Margem Ibérica Atlântica está organizado por el grupo de investigación Harea-Geología Litoral de la UPV/EHU (www.ehu.eus/harea-geologialitoral), que desarrolla actividades docentes e investigadoras ligadas al estudio multidisciplinar de los sedimentos litorales y marinos. El objetivo de este congreso es la presentación de resultados científicos novedosos por parte de investigadoras/es y estudiantes de postgrado, que muestren el avance en los estudios de ciencias marinas, fomentando la discusión constructiva entre todas/os las/os participantes.

se encarregasse do Laboratório da Sociedade no Aquário de Donostia-San Sebastián, indicando para seu assistente Joaquín Gómez de Llarena, que tinha uma grande experiência como geólogo especializado em sedimentos marinhos. O desenvolvimento do domínio das Ciências do Mar foi sendo consolidado com a implementação dos estudos científicos na Universidade de Bilbao a partir de 1971 (posteriormente Universidade do País Basco UPV/EHU), as atividades da Sociedade Cultural para a Pesquisa Marinha (INSUB) desde 1976, a criação do Serviço de Pesquisa Oceanográfica no ano de 1982 (mais tarde denominado Instituto Tecnológico, Pesqueiro e Alimentar AZTI) e ainda a realização em Donostia-San Sebastián do II Colóquio Internacional de Oceanografia do Golfo da Biscaia, em 1990.

Este X Simpósio sobre a Margem Ibérica Atlântica / X Simposio sobre el Margen Ibérico Atlántico é organizado pelo grupo de investigação Harea-Geología Litoral da UPV/EHU (www.ehu.eus/harea-geologialitoral), que desenvolve actividades de ensino e investigação ligadas ao estudo multidisciplinar dos sedimentos litorais e marinhos. O objetivo deste congresso é a apresentação de resultados científicos de investigadoras/es e estudantes de pós-graduação, que mostrem o progresso dos estudos em ciências marinhas e promovam uma discussão construtiva entre todas/os os participantes.

Aquariumen, eta haren laguntzailea Joaquín Gómez de Llarena –itsas sedimentuetan espezializatutako geologoa, eskarmentu handikoa– izan zedila adierazi zuen. Berrikiago, ikasketa zientifikoak ezarri ziren Bilboko Unibertsitatean (geroago Euskal Herriko Unibertsitatea edo UPV/EHU izango zena), 1971tik aurrera. Itsas Ikerketako Kultura Elkarteak jarduera desberdinak garatu ditu 1976tik, Ikerketa Ozeanografikoko Zerbitzua (gero, Teknologia, Arrantza eta Elikadura Institutua edo AZTI izendatua) sortu zen 1982an eta, 1990ean, Bizkaiko Golkoko Ozeanografiari buruzko 2. Nazioarteko Mahai Ingurua egin zen Donostian. Bada, horrek guztiak finkatu egin du gai honen garapen zientifikoa.

"X Simposio sobre el Margen Ibérico Atlántico / X Simpósio sobre a Margem Ibérica Atlântica" UPV/EHUko Harea-Itsas Bazterreko Geologia ikertaldeak antolatzen du (https://www.ehu.eus/eu/web/harea-geologialitoral/). Talde horrek itsasbazterreko eta itsasoetako sedimentuen diziplina anitzeko azterketei lotutako hezkuntza eta ikerketa jarduerak egiten ditu. Kongresu honen helburua da ikertzaileek eta graduondokoko ikasleek emaitza zientifiko berriak aurkeztea, bai eta itsas zientzietako azterlanetako aurrerapena erakustea eta parte hartzaile guztien arteko elkarrizketa konstruktiboa sustatzea ere.

El Puente Colgante (Puente Bizkaia) fue inaugurado en el año 1893 y declarado Patrimonio de la Humanidad por la UNESCO en 2006. Diseñado por Alberto de Palacio como el primer puente transbordador metálico del mundo, fue concebido originalmente como puerta de entrada a Bilbao desde el mar.

A Ponte Suspensa (Ponte Bizkaia) foi inaugurada em 1893 e declarada Património da Humanidade pela UNESCO em 2006. Projetada por Alberto de Palacio como a primeira ponte metálica para balsas do mundo, foi originalmente concebida como a porta de entrada em Bilbao, para quem chega do mar.

Zubi Esekia (Bizkaia Zubia) 1893an inauguratu zen eta UNESCOk Gizateriaren Ondare izendatu zuen 2006an. Alberto de Palaciok diseinatua, munduko lehen zubi transbordadore metaliko gisa, jatorriz itsasotik Bilbora sartzeko ate gisa sortu zen.

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PROGRAMA GENERAL / GERAL / OROKORRA

JUEVES/QUINTA-FEIRA/OSTEGUNA 07 JULIO/JULHO/UZTAILA

	AUDITORIO BAROJA	AUDITORIO ARRIAGA
09:00-09:30	Registro y Recogida documentación	
09:30-10:00	Acto Inaugural	
10:00-11:00	Conferencia Invitada	
11:00-11:30	PAUSA CAFÉ/PANELES	
11:30-13:30	Comunicaciones Orales SC1: Naturaleza y estructura del margen continental ibérico y macaronésico	Comunicaciones Orales ST6: Registros climáticos del Plioceno-Pleistoceno, ST5: Registro cuaternario del clima, nivel del mar e historia humana
13:30-15:00	COMIDA	
15:00-17:00	Comunicaciones Orales SC1: Naturaleza y estructura del margen continental ibérico y macaronésico, SC10: Tectónica activa en la Península Ibérica, ST2: Registro sedimentario Meso-Cenozoico	Comunicaciones Orales ST5: Registro cuaternario del clima, nivel del mar e historia humana, ST7: Depósitos de tsunami y de otros eventos marinos extremos, SC2: Dinámica, sedimentación y evolución ambiental de la zona costera
17:00-17:30	PAUSA CAFÉ/PANELES	
17:30-18:30	Comunicaciones Orales ST2: Registro sedimentario Meso-Cenozoico	Comunicaciones Orales SC2: Dinámica, sedimentación y evolución ambiental de la zona costera
18:30-19:30	SALA DE EXPOSICIONES LABOA: Presentación Paneles	
21:00	CENA DEL CONGRESO	

VIERNES/SEXTA-FEIRA/OSTIRALA 08 JULIO/JULHO/UZTAILA

	AUDITORIO BAROJA	AUDITORIO ARRIAGA
09:00-10:00	Conferencia Invitada	
10:00-11:00	Comunicaciones Orales SC5: Biología y ecosistemas marinos	Comunicaciones Orales SC12: Modelado y simulación numérica de procesos en el medio marino
11:00-11:30	PAUSA CAFÉ/PANELES	
11:30-13:30	Comunicaciones Orales ST3: Diagnóstico de la interacción entre clima, ecosistemas y presiones humanas, SC6: Hábitats y gestión del espacio submarino: zonas marinas protegidas	Comunicaciones Orales ST1: Registro sedimentario del Antropoceno, ST8: Contaminación por plásticos
13:30-15:00	COMIDA	
15:00-17:00	Comunicaciones Orales SC3: Morfología dinámica y sedimentación en las plataformas continentales, SC4: La circulación de las aguas profundas y sus sistemas morfodeposicionales	Comunicaciones Orales SC8: Recursos marinos renovables y no renovables, SC13: Procesos biogeoquímicos e interacciones atmósfera/océano/sedimento, ST4: Geoconservación, geodiversidad y patrimonio geológico litoral y marino Constitución del Grupo de Trabajo Español del proyecto IGCP 732
17:00-17:30	PAUSA CAFÉ/PANELES	
17:30-19:00	SALA DE EXPOSICIONES LABOA: Presentación Paneles	
19:15-19:30	ACTO DE CLAUSURA	

PROGRAMA GENERAL / GERAL / OROKORRA

SÁBADO/LARUNBATA 09 JULIO/JULHO/UZTAILA

10:00-19:30

SALIDA DE CAMPO
HISTORIA AMBIENTAL DE LA RÍA DE BILBAO Y
SU REGISTRO SEDIMENTARIO

PROGRAMA DETALLADO / DETALHADO / ZEHATZA

JUEVES/QUINTA-FEIRA/OSTEGUNA 07 JULIO/JULHO/UZTAILA

AUDITORIO BAROJA

	09:00-09:30	Registro y Recogida documentación
	09:30-10:00	Acto Inaugural: **Inmaculada Arostegui (**Vicerrectora de Investigación), **Amaia Esquisabel** (Directora de Investigación GV), **Fernando Plazaola** (Decano FCT), **Pedro Cuhna** (Organizador MIA 2018), **Alejandro Cearreta** (Responsable del Comité Organizador MIA 2022)
	10:00-11:00	Conferencia Invitada **Juan Tomás Vázquez**: Procesos volcánicos recientes en dominios submarinos de las Islas Canarias
	11:00-11:30	PAUSA CAFÉ/PANELES
SC1: Naturaleza y estructura del margen continental ibérico y macaronésico	11:30-11:45	Structure and geomorphology of the southeastern Iberian: The case of the Gulf of Vera/ **G. Ercilla, J. Galindo-Zaldívar, FAUCES cruise team**
	11:45-12:00	High resolution magnetic surveys reveal sources and bodies of the Central Atlantic Magmatic Province and Cretaceous Alkaline Province off West Portugal/ **M. Neres, P. Terrinha, J. Noiva, P. Brito, C. Ribeiro**
	12:00-12:15	Montes cántabros: nuevos datos y evidencias de deformación compresiva reciente/ **M. A. de la Fuente , J.L. Granja-Bruña, A. Muñoz, M. Druet , A. Maestro, J. Gallastegui**
	12:15-12:30	Crustal structure across the São Miguel Island (Azores, North Atlantic) and tectonic implications/ **L. Batista, C. Hübscher, P. Terrinha, L. Matias, A. Afilhado, A. Loureiro, B. Weiß**
	12:30-12:45	Aplicación de datos batimétricos en la cartografía geológica de la plataforma continental. Un ejemplo de la costa occidental del País Vasco/ **L. Rodríguez, N Vegas, A. Aranguren**
	12:45-13:00	Hyperextension and break-up along the Bay of Biscay and inversion in the North-Iberian Margin (NIM)/ **A. Madarieta-Txurruka, A. Pedrera, J. Galindo-Zaldívar, F. Estrada, J. García-Senz, G. Ercilla**
	13:00-13:15	The central Alboran Sea active tectonics: implications in seismic hazard of indenter and roll-back interaction/ **J. Galindo-Zaldívar, G. Ercilla, F. Estrada, J.A. Peláez, A.J. Gil, V. Tendero-Salmerón, J. Tomas Vázquez, A. Madarieta-Txurruka, L. González-Castillo**
	13:15-13:30	Nuevos datos gravimétricos y magnéticos marinos en el Margen Cantábrico occidental/ **A. Muñoz-Martín, J.L. Granja-Bruña, M.A. de la Fuente , J. Fiz, M. Druet , A. Maestro, J. Gallastegui**
	13:30-15:00	COMIDA
	15:00-15:15	MARIBNO amphibious project: Structure of the NorthWest IBerian MARgin: Role of the Inherited Tectonics in the Alpine extension and inversion/ **A. Muñoz-Martín, J.L. Granja-Bruña, M.A. de la Fuente, M. Duet, G. de Vicente, J. Gallastegui , A. Maestro**
SC10: Tectónica activa en la Península Ibérica	15:15-15:30	The Trans-Iberia Central Orogen and aborted subduction/ **G. de Vicente, P. Terrinha, R. Carbonell, A. Muñoz-Martín, A. Olaiz**
	15:30-15:45	New clues on the Alboran Sea geodynamic evolution from magnetic anomalies/ **V. Tendero-Salmerón, J. Galindo-Zaldívar, E. d'Acremont, M. Catalán, Y.M. Martos, A. Ammar, G. Ercilla**
	15:45-16:00	Geomorfología tectónica en el Canal de Mallorca, Promontorio Balear/ **J.T. Vázquez, O. Sánchez-Guillamón, D. Palomino, M.C. Fernández-Puga, N. Martínez-Carreño, P. Bárcenas, L.M. Fernández-Salas, M.O. Tello, M. Gómez-Ballesteros**

AUDITORIO ARRIAGA

	11:00-11:30	PAUSA CAFÉ/PANELES
ST6: Registros climáticos del Plioceno-Pleistoceno	11:30-11:45	Unlocking the secrets held by pollen in the Shackleton Site on the Iberian Margin: a snapshot on key interglacials of the last 800,000 years/ **D. Oliveira, S. Desprat, F. Naughton, T. Rodrigues, Q. Yin, R. Trigo, F. Abrantes, D. Hodell, M.F. Sánchez-Goñi**
	11:45-12:00	Latitudinal warming on Iberian Margin during Mid Pleistocene Transition/ **T. Rodrigues, A. Voelker, J.O. Grimalt, M. Casado, Y. Gonzalez, F. Abrantes**
	12:00-12:15	Disentangling the Early Pleistocene δ18O signal at the Iberian margin/ **M. Alonso-García, E. Salgueiro, A. Lopes, C.N. Rodriguez-Díaz, H. Kuhnert, J. Groeneveld, A.H. Voelker, T. Rodrigues, F.J. Sierro, F. Abrantes**
	12:15-12:30	Nuevos depósitos costeros del último interglaciar en el margen cantábrico/ **P. Bilbao, I. Álvarez, A. Aranburu, M. del Val, M. Arriolabengoa, E. Iriarte**
	12:30-12:45	Tracking abrupt climatic events for the last 40 kyr in SW Iberia (Gulf of Cadiz) – Preliminary results/ **P.F. Silva, M. Gomes, T. Drago, C. Roque, B. Alonso, F. Naughton, G. Ercilla, N. López-González, D. Casas, J.T. Vázquez**
ST5: Registro cuaternario del clima, nivel del mar e historia humana	12:45-13:00	Foraminíferos bentónicos como indicadores del nivel del mar en el estuario del Oka (N España)/ **A. García-Artola, A. Pascual, A. Cearreta**
	13:00-13:15	Características geomorfológicas, sedimentarias y cronológicas de la paleocosta del Último Máximo Glaciar en la plataforma continental cantábrica (Golfo de Bizkaia)/ **E. Iriarte, J. Rivera, M. del Val, P. Bilbao, A. García, V. Bruschi, L. Teira, P. Saiz, E. Álvarez-Fernández, M.A. Sánchez, R. Ontañón, P. Arias**
	13:15-13:30	Análisis y representación espacial de la variable tiempo sumergido bajo el nivel del mar durante la última fase glacial en las costas de la Península Ibérica/ **P. Fraile, M.E. Roldán, J.C. Mejías, C. Borja**
	13:30-15:00	COMIDA
	15:00-15:15	Environmental changes and human interactions during the Holocene: preliminary results from La Janda palaeolagoon (SW Iberia)/ **C. Val-Peón, J.A. López, J.I. Santisteban, R. Mediavilla, K. Reicherter**
	15:15-15:30	Sea level data-derived local/regional coastal tectonics in SW Iberia during the Holocene/ **J.I. Santisteban, R. Mediavilla, C. Val-Peón, J.A. López , M. Mathes-Schmidt, K. Reicherter**

JUEVES/QUINTA-FEIRA/OSTEGUNA 07 JULIO/JULHO/UZTAILA

AUDITORIO BAROJA

ST2: Registro sedimentario Meso-Cenozoico

16:00-16:15	Astronomical forcing on an Albian carbonate ramp from the Basque-Cantabrian basin/ **A. Payros, N. Martínez-Braceras, L.M. Agirrezabala, J. Dinarès-Turell**
16:15-16:30	Bentonite layers in the deep-water Black Flysch Group: mid-Cretaceous (Albian) record of explosive volcanism in the Basque-Cantabrian Basin/ **L.M. Agirrezabala, E. Rua-Alkain, F. Sarrionandia**
16:30-16:45	Impact of gasohydrothermal vents on a Cretaceous shallow-marine carbonate environment and biota replacement (western Basque-Cantabrian Basin)/ **A. Bodego , E. Iriarte, M. Ladrón de Guevara, L. Damas-Mollá, A. Aranburu**
16:45-17:00	Late Cretaceous post-rift fault activity in the eastern Basque-Cantabrian Basin: stratigraphic review and new evidence of submarine breccias/ **M. Ladrón de Guevara, A. Bodego, E. Iriarte**
17:00-17:30	PAUSA CAFÉ/PANELES
17:30-17:45	Geological evolution of western Iberia during middle Campanian to Ypresian/ **P.P. Cunha**
17:45-18:00	Geological evolution of western Iberia during Lutetian to middle Tortonian/ **P.P. Cunha**
18:00-18:15	Geological evolution of western Iberia since middle Tortonian/ **P.P. Cunha**
18:15-18:30	Strike-slip influenced extrusive diapirism of the Bermeo salt wall (Albian, Basque-Cantabrian Basin): evidence from fractures and the sedimentary record/ **L.M. Agirrezabala, P.A. Fernández-Mendiola**

AUDITORIO ARRIAGA

SC9	15:30-15:45	Sedimentary records of extreme events: using particle size and shape to link continental sources to shelf deposits/ **J. Pombo, A. Rodrigues, J. Duarte, A. Oliveira**
ST7: Depósitos de tsunami y de otros eventos marinos extremos	15:45-16:00	High-resolution X-ray CT-scans as an innovative tool to characterise offshore tsunami deposits/ **L. Feist, P.J.M. Costa, S. Falvard, R. Paris, J.I. Santisteban, P. Bellanova, K. Reicherter, the M152 scientific team**
	16:00-16:15	Vulnerability of complex Roman production networks on the Atlantic coasts of southern Iberia – the example of Boca do Rio/ **L. Feist, P. Bellanova, H. Laermanns, S. Frank, F. Hermann, M. Mathes-Schmidt, D. Brill, J.P. Bernardes, F. Teichner, H. Brückner, K. Reicherter**
	16:15-16:30	Offshore tsunami backwash deposits – hints through organic-geochemical analysis/ **P. Bellanova, J. Schwarzbauer, L. Feist, P. Costa, J.I. Santisteban, K. Reicherter, the M152 scientific team**
	16:30-16:45	The Baelo Claudia tsunami deposits/ **K. Reicherter, P.G. Silva, I. García-Jiménez, F. Prados**
SC2: Dinámica, sedimentación y evolución ambiental de la zona costera	16:45-17:00	La playa de Ostende (Castro Urdiales, Cantabria): un laboratorio natural para el estudio de procesos geológicos/ **A. Pascual, J. Elorza, B. Martínez-García**
	17:00-17:30	PAUSA CAFÉ/PANELES
	17:30-17:45	Organic matter in intertidal estuarine margins: the case of Tróia (Sado estuary, Portugal)/ **V. Lopes, M.C. Freitas, M. Leira, M. Inácio**
	17:45-18:00	First approach to organic carbon quantification and sediment characterization in the Minho estuary marshes/ **V. Lopes, X.L. Otero, M.C. Freitas**
	18:00-18:15	Launching project RECAP - REduce atmospheric Carbon by Alkalinity enhancement in intertidal environments: Potential and impacts/ **I. Mendes, A. Cravo, J. Schönfeld, Ó. Ferreira, A.R. Carrasco, P. Grasse, A. Gomes, C. Correia, J. Lübbers**
SC7	18:15-18:30	Evolução paleoambiental e ocupação mesolítica do Estuário do Sado/ **A.M. Costa, M.C. Freitas, A.C. Araújo, M. Diniz, P. Arias**

18:30-18:45 — SALA DE EXPOSICIONES LABOA: Presentación Paneles
Moderada por **Ana Pascual, Ane García-Artola, Julio Rodríguez, Jon Gardoki**

SC1: Naturaleza y estructura del margen continental ibérico y macaronésico	Nuevo Atlas Geológico Digital del Margen Continental Ibérico Atlántico/ **T. Medialdea, L. Somoza, F.J. González, A. Lobato, E. Marino**
	Crista Madeira-Tore: Investigação geológica, oceanográfica e biológica/ **P. Terrinha, N. Lourenço, P. Madureira, M. Carapuço, P. Nogueira, J. Arteaga, C. Lopes, L. Batista, H. Ferreira, V. Magalhães, S. Velez, M. Neres, M. Nogueira, M. Seixas, A. Calado, A. Afonso, R. Bettencourt, B. Ramos, M. Souto**
	Preliminary deep-sea data analysis collected at Gloria Seamount, Azores-Biscay Rise/ **I. Tojeira, L. Ribeiro, T. Rafael, M. Albuquerque, M. Simões, P. Madureira**
	Crecimiento de deltas de lava sobre los fondos marinos de la parte occidental de la isla de La Palma a lo largo de la erupción del 2021, Islas Canarias/ **J.T. Vázquez, M. Gómez-Ballesteros, O. Sánchez-Guillamón, B. Arrese, M. García, J.A. Lozano-Rodríguez, D. Palomino, C. Presas-Navarro, E. Fraile-Nuez**
SC10	Caracterização sismo-estratigráfica das estruturas geológicas presentes nos níveis superiores da plataforma continental do barlavento algarvio (Portugal)/ **A. Vinhas, A. Rodrigues**
ST2: Registro sedimentario Meso-Cenozoico	Estudio cicloestratigráfico y bioestratigráfico de la transición Eoceno medio/superior en el margen continental noribérico (Formación margas de Pamplona, Pirineo occidental)/ **U. Olabarrieta, A. Payros, J. Dinarès-Turell, G. Bernaola**
	Deep-sea water paleoenvironmental conditions in the mid-Cretaceous of the Basque-Cantabrian Basin based on microfaunal analysis (Black Flysch Group and Plentzia Formation)/ **L.M. Agirrezabala, A. Pascual, J. Rodríguez-Lázaro**

ST6: Registros climáticos del Plioceno-Pleistoceno	Late Quaternary marine record of Climate Change in the Basque Basin/ **J. Rodríguez-Lázaro, A. Pascual, Z. Varela, B. Martínez-García**
	¿Es *Neogloboquadrina pachyderma* un buen indicador de los intervalos fríos registrados en el Golfo de Bizkaia durante los últimos 36.000 años?/ **Z. Varela, A. Pascual, J. Rodríguez-Lázaro**
ST5: Registro cuaternario del clima, nivel del mar e historia humana	Distribution of recent planktonic foraminifera in surface sediments of the Basque shelf (S Bay of Biscay): oceanographic implications/ **B. Martínez-García, A. Pascual, J. Rodríguez-Lázaro, A. Bodego**
	Evolución paleoambiental de la Depresión de La Janda (Cádiz, España) durante los últimos 26.000 años/ **R. Mediavilla, J.I. Santisteban, C. Val-Peón, K. Reicherter, M. Mathes-Schmidt, L.A. Galán de Frutos, B. del Moral, J.A. López-Sáez**
SC9: Registro geológico de eventos marinos extremos	Unravelling the November 1st, 1755 tsunami record across the Atlantic/ **F. Fatela, P. Costa, F. Dourado**
	Multiproxy characterization of high energy layers in the inner continental shelf of Quarteira (Southern Portugal) – Preliminary results/ **J. Santos, T. Drago, D. Moura, V. Magalhães, C. Roque, P.F. Silva, A.I. Rodrigues, P. Terrinha, A. Mena, G. Francés, A. Lopes, A. Alberto, M.A. Baptista**
	The 1755 CE Lisbon tsunami deposits in El Palmar de Vejer, Spain/ **P. Bellanova, M. Frenken, L. Feist, J. Schwarzbauer, K. Reicherter**
SC2: Dinámica, sedimentación y evolución ambiental de la zona costera	Petroleum coke as a chronological marker: insights from tidal marsh sediments of the Sado estuary, SW Portugal/ **J. Moreno, E. Leorri, F. Fatela, M.C. Freitas, F. Moreno, J. Mirão, L. Dias, M. Leira, P. Masqué, A. Russo, A. Cunha, M. Inácio, W. Blake**
	Control of the distribution of persistent organic pollutants in the Gulf of Biscay and Galicia: Polycyclic Aromatic Hydrocarbons (PAHs)/ **L. Viñas, B. Pérez-Fernández, J. Bargiela**
	Human impacts on the Northern Iberian Coast: Brominated pollutants/ **L. Viñas, B. Pérez-Fernández, I. Alves, R. Ruiz**
	Presence of banned chlorinated pollutants in sediments of the Northern Iberian Coast/ **L. Viñas, B. Pérez-Fernández, J.A. Soriano**
	Short term evolution of a small dredged test area in the Algarve southern inner shelf/ **M. Rosa, T. Drago, S. Teixeira, R. Taborda, J. Santos**

21:00	CENA DEL CONGRESO

VIERNES/SEXTA-FEIRA/OSTIRALA 08 JULIO/JULHO/UZTAILA

AUDITORIO BAROJA

	09:00-10:00	Conferencia Invitada **Fátima Abrantes**: IODP Expedition 397 – Iberian Margin Paleoclimate
SC5: Biología y ecosistemas marinos	10:00-10:15	Distribution of the alien bivalve *Xenostrobus securis* (Lamarck, 1819) in the coast of Bizkaia (northern Iberian Peninsula) and its relationship with the indigenous *Mytilus galloprovincialis* Lamarck, 1819/ **M. Sanz-Latorre, M. Soto, O. Diaz de Cerio, I. Valenciano, M. Gutiérrez, U. Izagirre**
	10:15-10:30	The relation between currents and Meagre ("Corvina") migration patterns along the southern Portuguese coast/ **E. Garel, L. de Oliveira, D. Abecasis**
	10:30-10:45	Comunidades macrobentónicas en campos de pockmarks frente a la costa vasca (SE Golfo de Vizcaya)/ **J.M. Garmendia, I. Galparsoro, I. Muxika, J.G. Rodríguez, B. Arrese, I.P. Díez-García, M. Gómez-Ballesteros, F. Sánchez**
	10:45-11:00	Sponges biodiversity in Capbreton Canyon/ **J Cristobo, C. Boza, A. Calvo-Díaz, P. Ríos**
	11:00-11:30	PAUSA CAFÉ/PANELES
ST3: Diagnóstico de la interacción entre clima, ecosistemas y presiones humanas	11:30-11:45	Modeling megrims spatial distribution from commercial fleet activity/ **J. Rodríguez-Gutierrez, J.M. González-Irusta, A. Rodríguez, E. Ceballos, D. Cano, J. Castro, M. Hidalgo, A. Punzón**
	11:45-12:00	Effects of the demersal fisheries on benthic habitats diversity/ **A. Punzón, U. Fernández-Arcaya, J.M. González-Irusta, T. Farriols, A. de la Torriente, A. Rodríguez-Basalo, E. Ceballos,P. Martín-Sosa, E. Massuti, J.L. Rueda, F. Sánchez, A. Serrano**
	12:00-12:15	Cyanobacterial blooms affecting circalittoral vulnerable benthic communities in the Canary Islands/ **L. Martín-García, M. González-Porto, J.M. Falcón, E. González, S. Jiménez, N. Dionis, N. Rancel, M. Sansón, P. Martín-Sosa**
	12:15-12:30	Identification of longline fishing grounds using Machine Learning for benthic habitat impact assessment/ **D. Cano, J. Rodríguez, M. Sainz, A. Rodríguez, A. Punzón**
SC6: Hábitats y gestión del espacio submarino: zonas marinas protegidas	12:30-12:45	Advances in non-invasive methods in the study and monitoring the conservation status of deep-sea benthic vulnerable habitats/ **F. Sánchez, J.M. Rodríguez, E. Prado, C. González-Pola, A. Rodríguez-Basalo, C. Rodríguez-Cabello, A. Abad-Uribarren, L. Modica, P. Ríos, J. Cristobo**
	12:45-13:00	Epibenthic communities of pockmark fields in Capbreton canyon system (southern Bay of Biscay)/ **C. Rodriguez-Cabello, P. Ríos, L. Modica, A. Abad, A. Rodríguez-Basalo, J. Cristobo, E. Prado, B. Arrese, J.M. Garmendia, I. Galparsoro, M. Gómez-Ballesteros, F. Sánchez**
	13:00-13:15	OSPAR indicators integration to assess the benthic habitats' environmental status in response to the trawling effort/ **M. Plaza-Morlote, A. García-Alegre, A. Serrano, A. Punzón, J.M. González-Irusta**
	13:15-13:30	Modelling and mapping sedimentary habitats in the Avilés Canyon System, Cantabrian Sea/ **L. Modica, C. Rodriguez-Cabello, A. Rodríguez-Basalo, P. Ríos, J. Cristobo, A. Abad, E. Prado, F. Sánchez**
	13:30-15:00	COMIDA

AUDITORIO ARRIAGA

SC12: Modelado y simulación numérica de procesos en el medio marino	10:00-10:15	Influencia del aumento del nivel del mar en las marismas del estuario del Oka, País Vasco/ **B. Egidazu, M. Monge-Ganuzas, M. Aranda, G. Peralta**
	10:15-10:30	Modeling erosional mitigation solutions in sandy coasts: intervention scenarios in Barra-Vagueira, Portugal/ **B. Mendiguren, C. Coelho, M. Ferreira, R. Pombo, P. Narra, A. Cardoso**
	10:30-10:45	SMRM vs SLAMM: a comparison between two rule-based models of marsh response to sea-level rise/ **M. Inácio, A.G. Cunha, M.C. Freitas, V. Lopes, M. Leira, C. Andrade**
	10:45-11:00	EMODnet: nodo de información geoespacial para el análisis y modelización de distintos procesos en el medio marino/**J. Valencia, G. Ercilla**
	11:00-11:30	PAUSA CAFÉ/PANELES
ST1 : Registro sedimentario del Antropoceno	11:30-11:45	Magnetismo ambiental como trazador de impactos antropogénicos en la Ría de Avilés y la Playa de Portazuelos (Asturias, norte de España)/ **V. Villasante-Marcos, J. Gardoki, J.E. Gómez-Arozamena, M.J. Irabien, A. Cearreta, A. García-Artola, I.E. Quijada**
	11:45-12:00	Señales antropogénicas en el registro sedimentario reciente del interior de la Ría de Ferrol (Galicia, NO España)/ **J. Gardoki, A. Cearreta, A. García-Artola, M.J. Irabien, J. Gómez-Arozamena, V. Villasante-Marcos**
	12:00-12:15	Local background estimation of trace elements in sediments. A methodological approach in the land-to-ocean boundary/ **M.A. Álvarez-Vázquez, G. Farinango, R. Prego**
	12:15-12:30	Tasas de sedimentación recientes en el cantábrico: estudio comparativo de sedimentación en estuarios y lagos/ **J. Remondo, M. Morellón, J. Bonachea, J. Gómez-Arozamena, A. Cendrero, V. Rivas, V. Villasante-Marcos, L.M. Forte, J.L. Cavallotto, P. Cruz, M. Leira, C. Sierra-Fernández, V. Bruschi, C, Morales, J. Gardoki J.E. Ortiz, L. Rodríguez-Rodríguez, F.J. Ezquerra, M. Puente, A. Barreda**
	12:30-12:45	Hacia una geoarqueología de los paisajes culturales marismeños: procesos de reclamación, urbanización y restauración en los estuarios de la costa vasca/ **J. Narbarte, E. Iriarte, J.A. Quirós**
ST8: Contaminación por plásticos	12:45-13:00	Microplastics alter the functioning of marine microbial communities/ **D. Montoya, L. Polimene, E. Rastelli, R. Casotti, V. Manna, A.C. Trano, C. Santinelli, M. Saggiomo, M. Sprovieri, C. Sansone, C. Corinaldesi, J.M. Montoya, C. Brunet**
	13:00-13:15	El plástico en los sedimentos: detección y caracterización mediante tomografía axial computarizada (TAC)/ **E. Iriarte, A.C. de Dios**
	13:15-13:30	Dispersion of microplastics from the Mondego estuary to the open ocean/ **F. Bessa, A. Guilherme, B. Agante, P. Sobral, E. Valente, C. Palma**
	13:30-15:00	COMIDA

VIERNES/SEXTA-FEIRA/OSTIRALA 08 JULIO/JULHO/UZTAILA

AUDITORIO BAROJA

SC3: Morfología dinámica y sedimentación en las plataformas continentales	15:00-15:15	Light minerals in coastal sediments of the Ártabro Gulf (NW Iberian Peninsula): identification, abundances, distribution and origin/ **R. Prego, J. Esteve, S. Giralt, J. Ibañez, M.A. Álvarez-Vázquez**
	15:15-15:30	Overview of nepheloid layer dynamics off the Portuguese continental margin/ **A.T. Campos Oliveira, A.I. Santos, R. Guerra Santos, N. Zacarias**
	15:30-15:45	Internal Solitary Wave effects on acoustic Doppler current profiler (ADCP) backscattering patterns in the water column (Figueira da Foz – W Portugal)/ **A.I. Santos, J. Magalhães, A. Oliveira, P.B. Oliveira, R. Nolasco, N. Zacarias, A. Amorim**
	15:45-16:00	Characterization and controlling factors of incised valley systems on a continental margin with insignificant fluvial inputs: Algarve continental shelf, Gulf of Cadiz/ **A. Carrión-Torrente, F.J. Lobo, A. Puga-Bernabéu, M. Luján, I. Mendes, T.J.J. Hanebuth, S. Lebreiro, M. García, M.I. Reguera, L. Antón, D. Van Rooij, J. Goff, J. Cerrillo-Escoriza**
	16:00-16:15	Contributo para o conhecimento da cobertura sedimentar marinha da Ilha da Madeira/ **S. Moreira, A. Rodrigues, J. Pombo, Anabela Oliveira, J.F. Duarte**
SC4: La circulación de las aguas profundas y sus sistemas morfodeposicionales	16:15-16:30	Los campos de pockmarks en el sistema de cañones submarinos de Capbreton/ **B. Arrese, I. Díez-García, M. Gómez-Ballesteros, I. Galparsoro**
	16:30-16:45	Mica flakes and framboidal pyrite in gulf of Cádiz contourites as accurate Mediterranean Overflow strength proxies/ **J.P. Tarruella, T.M. Béjard, F.J. Sierro**
	16:45-17:00	Interacción entre procesos sedimentarios gravitacionales y de corrientes de fondo en el Cañón de Algeciras (Margen NE del Estrecho de Gibraltar)/ **J.T. Vázquez, G. Ercilla, D. Casas, D. Palomino, B. Alonso, P. Bárcenas, L.M. Fernández-Salas, N. López-González, M.P. Mata, J. Nespereira, M.O. Tello**
	17:00-17:30	PAUSA CAFÉ/PANELES

AUDITORIO ARRIAGA

SC8: Recursos marinos renovables y no renovables	15:00-15:15	Long-term changes of wind and waves in the Bay of Biscay (1979-2019)/ **J. Sáenz, G. Ibarra-Berastegi, A. Ulazia, P. Serras, J. González, G. Esnaola**
	15:15-15:30	First steps in the development of intensive aquaculture of the thicklip grey mullet Chelon labrosus (Risso, 1827)/ **M. Sanz-Latorre, N. Conlledo, D. Mensah, J. Goikoetxea, U. Izagirre, M. Soto, R. Sudupe, P. Brettes, A. de Diego, X. Lekube**
SC13: Procesos biogeoquímicos e interacciones atmósfera/ océano/sedimento	15:30-15:45	The use of passive samplers as alternative for the impact assessment of dredging activities in port waters/ **H. Carvalhal, I. Menchaca, M.J. Belzunce-Segarra, J. Franco, J. Larreta, N. Montero, G. Rodríguez**
	15:45-16:00	Estuarine sediment contamination in the Southwest of Spain through bivalves/ **E. Bonnail, P. Cruz-Hernández, R. Antón-Martín, I. Riba, T.Á. DelValls**
ST4	16:00-16:15	Geological sites of scientific value in the Iberian Atlantic Margin/ **M. Monge Ganuzas, P. Pereira, J. Brilha**
	16:15-17:15	Constitución del Grupo de Trabajo Español del proyecto IGCP 732 "LENGUAJE del Antropoceno (Lecciones de impacto antropogénico: una red de conocimiento de señales geológicas para unir y evaluar la evidencia global del Antropoceno)"/ **Rosa M. Mediavilla**
	17:00-17:30	PAUSA CAFÉ/PANELES

17:30-19:00	SALA DE EXPOSICIONES LABOA: Presentación Paneles Moderada por **Ana Pascual, Ane García-Artola, Julio Rodríguez, Jon Gardoki**

SC5: Biología y ecosistemas marinos	Preliminary characterization of the benthic megafaunal communities of the deep-sea canyon Ribeira Brava, south of Madeira Island/ **J. Lobo-Arteaga, C. Lopes, M. Seixas, C. Bartilotti, M. Tuaty-Guerra**
	Characterization of the benthic communities in the Tagus Delta: the macrofauna within the methane gas polygon/ **R. Soares, J. Lobo-Arteaga, C. Bartilotti**
	Exploring fauna behaviour using baited cameras on the pockmarks located in the Capbreton Canyon System (Cantabrian Sea)/ **C. Rodríguez-Cabello, A. Abad-Uribarren, A. Rodríguez-Basalo, J. Rodríguez, C. González-Pola, P. Ríos, E. Prado, L. Modica, J. Cristobo, F. Sánchez**
	Aplicación de nuevos bioensayos para predecir y evaluar la toxicidad de sedimentos contaminados en el Golfo de Bizkaia/ **N. Garcia-Velasco, J.A. Carrero, E. Urionabarrenetxea, B. Zaldibar, A. Gredilla, A. de Diego, U. Izagirre, M. Soto**
	Trawling impacts on the distribution of *Funiculina quadrangularis* fields on the Cantabrian Sea and Galicia/ **A. García-Alegre, S. Ruiz-Pico, M. Plaza-Morlote, A. Punzón, U. Fernández-Arcaya A. Serrano, J.M. González-Irusta**
	Heavy metal tolerance in marine bacteria isolated from coastal sediments of the Bay of Biscay/ **U. Arrizabalaga-Luzuriaga, B. Rincón-Tomás, C. Perez-Cruz, E. Bilbao, L. Alonso-Sáez**

ST3: Diagnóstico de la interacción entre clima, ecosistemas y presiones humanas	Evolución del estado de los bancos naturales de Chirla (*Chamelea gallina)* en el litoral mediterráneo de Andalucía/ **C. Ciércoles, P. Marina, J. Urra, J.M. Serna, J. Baro**
	Contrasting effects of fishing and warming on functional traits configuration of Mediterranean and Atlantic demersal communities/ **J. Polo, M. Sainz-Bariain, L. Pecuchet, M. Hidalgo, A. Punzón, E. García, M. Vivas, A. Esteban, J.M. González-Irusta, M. Sanz-Martín, L. Gil de Sola, A. Rodriguez, L. López-López**
	The importance of species selection for assessing the vulnerability of marine communities to climate change and trawling using trait-based indices/ **M. Sainz, J. Polo, M. Hidalgo, A. Punzón, E. García, M. Vivas, A. Esteban, L. Gil de Sola, L. López**
	IMPALHA: Diagnosis of the impact of bottom longlines on benthic habitats/ **M. Huerta, V. Duque-Nogal, M. Ruíz, P. Verisimo, J. Polo, M. Blanco, P. Carrillo, I. Gutiérrez, D. Cano, M. Sáinz, U. Fernández-Arcaya, F. Sánchez, M. Gómez, P. Martín-Sosa, A. Serrano, I. Galparsoro, A. Punzón**
	Comparison of the spatial distribution of longline fisheries from VMS and AIS information/ **V. Duque-Nogal, M. Huerta, D. Cano, J. Rodríguez, M. Sáinz, P. Verisimo, U. Fernández-Arcaya, A. Rodríguez-Basalo, E. Ceballos, M. Ruíz, A. Punzón**
	Impact of the bottom long-line fishing on the *Asconema setubalense* community at the "Banco de la Concepción" seamount (The Canary Islands) under low fishing intensity conditions/ **J.M. Falcón, L. Martín-García, M. González-Porto, A. Punzón, P. Martín-Sosa**
	Exploitation patterns of bottom fisheries after the "El Cachucho" MPA management plan implementation/ **P. Verísimo, A. Rodríguez-Basalo, U. Fernández-Arcaya, E. Ceballos, J. Rodríguez, M. Ruiz, M. Sainz, F. Sánchez, A. Punzón**
SC6	The importance of deep-sea scientific knowledge for nature conservation: The King's Trough case study/ **T. Rafael, I. Tojeira, L. Ribeiro, M. Albuquerque, M. Simões, L. Somoza, T. Medialdea, F.J. González, P. Madureira**
SC3: Morfología dinámica y sedimentación en las plataformas continentales	Depositional environmental classification based on entropy analysis: Application to bottom continental shelf sediments (Western and Southern Portugal)/ **A.T. Campos, R. Guerra, A.I. Santos**
	Controlo morfológico e de correntes litorais na distribuição de sedimentos na plataforma continental do Alentejo/ **J. Noiva, M. Rosa, P. Brito, M. Neres, P. Terrinha, C. Ribeiro**
	Living and dead benthic foraminifera from the submarine prodelta off the Guadalfeo River, northern Alboran Sea/ **I. Mendes, L. Guerra, P. Bárcenas, J. Cerrillo, A. Puga-Bernabéu, A. Mena, F.J. Lobo**
SC4: La circulación de las aguas profundas y sus sistemas morfodeposicionales	Slope stability of the Guadiaro-Baños contourite drifts (SW Mediterranean)/ **M. Yenes, D. Casas, J. Nespereira, N. López-González, D. Casalbore, S. Monterrubio, B. Alonso, G. Ercilla, C. Juan, P. Bárcenas, D. Palomino, P. Mata, J.T. Vázquez, F. Estrada, M. Azpiroz-Zabala, M. Teixeira**
	Morphosedimentary dynamics based on channels hierarchy in the Capbreton canyon system/ **I. Díez-García, B. Arrese, M. Gómez-Ballesteros, I. Galparsoro**
	A preliminary megabenthic epifauna analysis in pockmarks structures in the Capbreton Canyon System, Cantabrian Sea/ **A. Abad-Uribarren, P. Ríos, A. Rodríguez-Basalo, C. Rodriguez-Cabello, E. Prado, L. Modica, J. Rodríguez, J. Cristobo, F. Sánchez**
	Contouritic facies on the Guadiaro-Baños drifts (Alboran Sea, SW Mediterranean): the role of intermediate and deep Mediterranean bottom currents over the last 29 kyr/ **B. Alonso, D. Casas, C. Juan, N. López-González, I. Cacho, G. Ercilla, B. Ausín, P. Bárcenas, D. Palomino, M. Yenes, J. Nespereira, P. Mata**
ST1: Registro sedimentario del Antropoceno	First data of the PAHs along a sediment core from Ria de Vigo/ **L. Viñas, B. Pérez-Fernández, A.V. Filgueiras, J. Bargiela**
	The influence of geological setting on the erosion of open and pocket beaches: two study cases on the NW Iberian Atlantic Coast/ **Á. Fontán-Bouzas, T. Abreu, C. Ferreira, L. López-Olmedilla, P.A. Silva, A. Bernabeu, J. Alcántara-Carrió**
	Generación de nuevas variables polínicas antrópicas como herramienta para cuantificar la perturbación de los ecosistemas litorales en el Antropoceno/ **C.A. Galaz-Samaniego, M.C. Peñalba, A. Cearreta**
ST4	Alteraciones del terreno en la costa vasca: análisis a través de modelos digitales del terreno/ **P. Bilbao, I. Álvarez, A. Aranburu, M. del Val, M. Arriolabengoa, E. Iriarte**

19:15-19:30	ACTO DE CLAUSURA

10:00-19:30

Salida de campo:
Historia ambiental de la Ría de Bilbao y su registro sedimentario
Coordinada por Alejandro Cearreta, María Jesús Irabien, Karmele Urtiaga

A preliminary megabenthic epifauna analysis in pockmarks structures in the Capbreton Canyon System, Cantabrian Sea

Alberto Abad-Uribarren[1*], Pilar Ríos[2], Augusto Rodríguez-Basalo[1], Cristina Rodriguez-Cabello[1], Elena Prado[1], Larissa Modica[1], Juanma Rodríguez[1], Javier Cristobo[2], Francisco Sánchez[1]

[1*] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain alberto.abad@ieo.csic.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Gijón (IEO-CSIC), Spain.

Key words: *1180 benthic habitat, pockmarks, Capbreton Canyon, ROTV.*

The Capbreton Canyon System (CCS) is currently under study for its proposal as a Site of Community Importance under the EU Habitats Directive. Two main habitats listed in this Directive have been located in the area so far, the 1170 (reefs) and the 1180, localized in pockmarks fields, seafloor rounded depressions indicators of fluid escape from beneath the seabed sediments. Results of the analysis of photogrammetric vehicle (ROTV) imaginary obtained during the INTEMARES-CAPBRETON 2019 and 2020 surveys are presented. The study comprised almost 4 hours of video covering 7 different pockmarks located in a depth range from 400 to 1000 m. Species from seven different phyla were found inside the pockmarks, including 14 species of fish, 8 species of echinoderms, 6 species of cnidarians, 5 species of crustaceans and 1 of sponges and mollusks. The highest abundances of benthopelagic fishes were given by the roughsnout grenadier (*Trachyrincus scabrus*) and two species of the genus *Hoplostethus*, the orange roughy (*H. atlanticus*), and the Mediterranean slimehead (*H. mediterraneus*). In relation to the abundance of invertebrates, the urchins *Gracilechinus acutus* and *Araeosoma fenestratum*, and the crab *Chaceon affinis* stand out. Large areas with a high density of ceriantharia were also found. It should be noted that during the recording in one of the pockmarks, what appears to be an emanation event was recorded, although this information needs to be contrasted.

Acknowledgments. This study was conducted in the context of the LIFE-IP-INTEMARES project (Integrated, innovative and participatory management of the Natura 2000 Network in the Spanish marine environment) specifically developed within the action A.2.2 "Actions to improve the knowledge for the declaration of new marine spaces due to their importance for habitats".

IODP Expedition 397 – Iberian Margin Paleoclimate

David Hodell[1], Fatima Abrantes[2*], Carlos Alvarez-Zarikian[3]

[1] Godwin Laboratory for Palaeoclimate Research, Department of Earth Sciences, University of Cambridge, UK.
[2*] Division of Marine Geology and Georesources, Portuguese Institute for the Sea and Atmosphere, Lisbon, Portugal, fatima.abrantes@ipma.pt
[3] International Ocean Discovery Program, Texas A&M University, USA.

Key words: *high sedimentation, ice-cores, terrestrial climate, Pliocene, Pleistocene.*

The seminal work of Sir Nicholas Shackleton on marine sediment sequences off the Iberian Peninsula demonstrated this region's record to be correlatable to the polar ice cores in Greenland and Antarctica. Moreover, the narrow continental shelf in the region permits a rapid delivery of material from the nearby continent to the deep-sea, thereby providing a record of European terrestrial climate. IODP Site U1385 was drilled at the same location to 155.9 meters below the seafloor during IODP Expedition 339. The study of this site confirmed the continuity of high sedimentation rates (10 to 20 cm per thousand years) back to 1.45 million years and the great potential of the Iberian margin to yield longer records of millennial-scale climate change and land-sea comparisons.
Expedition 397 of the International Ocean Discovery Program (IODP) will extend this remarkable sediment archive to 3 – 5 Ma and drill additional sequences in water depths from 1304 to 4686 meters below sea level. A depth transect that shall allow the reconstruction of the past variability of the subsurface water masses of the eastern North Atlantic basin and investigate their role in carbon storage and its effect on atmospheric CO_2 from orbital to millennial time scales. Furthermore, multiple holes will be drilled at the four primary sites identified to ensure complete recovery of the stratigraphic sections at each site. The cores recovered will provide present and future generations of paleoceanographers with the raw material needed to reconstruct the North Atlantic climate at high temporal resolution for the entire Quaternary and Pliocene.

Acknowledgements. IODP - International Ocean Discovery Program explores the ocean floor to better understand Earth's history and is endorsed by the USA, Europe, Japan, Australia-New Zealand IODP Consortium, India Korea and China.

Strike-slip influenced extrusive diapirism of the Bermeo salt wall (Albian, Basque-Cantabrian Basin): Evidence from fractures and the sedimentary record

Luis M. Agirrezabala[1*], Pedro Ángel Fernández-Mendiola[1]

[1*] Geologia Saila, Euskal Herriko Unibertsitatea UPV/EHU, Sarriena auzoa z/g, 48940 Leioa, Basque Country, l.agirrezabala@ehu.eus

Key words: *calcite veins, clastic dykes, graben, resedimentation, ophite clasts.*

Salt tectonics influenced by strike-slip systems are far less understood than those influenced by extensional or contractional systems. Recent works on salt diapirs from the Basque-Cantabrian Basin document their syndepositional activity during Cretaceous times but the regional tectonic control on their development is poorly known and remains a matter of debate. Here we document the Bermeo salt wall and the surrounding sedimentary succession that show evidences for strike-slip influenced growth. The Bermeo salt wall is an outcropping E-trending elongated structure cored by Triassic (Keuper) evaporites, red clays and ophites. It is discordant to the overburden Bermeo marls (Aptian-Lower Albian) but is covered at its eastern end by the Black Flysch Group (Middle Albian-Lower Cenomanian). Adjacent to the salt wall, the discordant sedimentary succession shows a fracture system composed of faults, calcite shear and extensional veins, and ophitic clastic dykes. East-trending sub-vertical shear calcite veins present sub-horizontal slickenfibers and steps congruous with left-lateral movements, and associated to them right-stepping en-echelon extensional veins occur. On the other hand, coeval NE-oriented high-angle normal faults, extensional veins and clastic dykes indicate a mean NW-SE trending extensional stress. The stated arrangement fracture pattern is compatible with an E-oriented sinistral strike-slip strain ellipse. In the uppermost part of the fractured succession, a graben filled with mass transport deposits of probable Early Albian age occur. These deposits are composed of sedimentary breccias with ophite, marl and limestone clasts, and slumped beds containing deformed clastic dykes, suggesting they postdate the underlying fracture system. The resedimentation of Triassic ophite masses points to diapiric extrusion of the Bermeo salt wall to the Albian seabed after the formation of a fracture system and overpressure fluids (ophitic clastic rocks) under a regional sinistral strike-slip regime.

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Deep-sea water paleoenvironmental conditions in the mid-Cretaceous of the Basque-Cantabrian Basin based on microfaunal analysis (Black Flysch Group and Plentzia Formation)

Luis M. Agirrezabala[1*], Ana Pascual[1], Julio Rodríguez-Lázaro[1]

[1*] Geologia Saila, Euskal Herriko Unibertsitatea UPV/EHU, Sarriena auzoa z/g, 48940 Leioa, Basque Country, l.agirrezabala@ehu.eus

Key words: *Foraminifera, ostracods, hypoxia, oceanic circulation, morpho-structural highs.*

The Black Flysch Group is a lithostratigraphic unit cropping out along the whole Pyrenean domain (northern part). It is composed of marine resedimented clastic deposits and hemipelagic rocks (mudstones rich in organic matter and pyrite) containing ammonites, belemnites, microfauna and trace fossils (*Zoophycos* and *Nereites* ichnofacies). Although these deposits have been interpreted as sedimented in a deep-water environment, the paleobathymetry and paleoceanographic conditions under they deposited are poorly known. In order to constrain these conditions, a microfaunal analysis (planktonic and benthic foraminifera and ostracods) of samples from the Black Flysch and the overlying hemipelagic carbonate Plentzia Formation at the Armintza section has been carried out. Obtained preliminary results allow us to characterize biostratigraphycally the *Rotalipora ticinensis*, *R. appeninica* y *R. cushmani* biozones (Upper Albian-Middle Cenomanian). The proportion of planktonic relative to benthic foraminifera is in all samples higher than 90% indicating a deep-water base-of-slope environment. Planktonic foraminifera of the Black Flysch are dominated by globular hedbergellids while keeled foraminifera are rare, suggesting a dominance of shallow-water forms over deep-water forms. The rare benthic foraminifera (<1%) occurring in this unit together with the presence of the ostracod *Cytherella* gr. *ovata* and early diagenetic pyrite and siderite suggest hypoxic conditions on the paleoseabed. These conditions could be the result of the oxidation of the abundant organic matter present in the sediments. In addition, the development of small sub-basins bounded by submarine morpho-structural highs during the deposition of the Black Flysh would reduce importantly the oceanic water circulation and, consequently, the oxygenation of the seafloor. Finally, the Plentzia Formation deposits show an important increment in the proportion of benthic foraminifera, the diversity of benthic species, as well as in the proportion of keeled planktonic foraminifera, suggesting a more oxygenated seabottom and a better oceanic water circulation. This significant change in the microfauna coincides with an important tectono-sedimentary event documented in the basin.

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Bentonite layers in the deep-water Black Flysch Group: mid-Cretaceous (Albian) record of explosive volcanism in the Basque-Cantabrian Basin

Luis M. Agirrezabala[1*], Eider Rua-Alkain[2], Fernando Sarrionandia[1]

[1*] Geologia Saila, Euskal Herriko Unibertsitatea UPV/EHU, Sarriena auzoa z/g, 48940 Leioa, The Basque Country, l.agirrezabala@ehu.eus

[2] Pinu Bidea 12, Antigua, 20018 Donostia, The Basque Country.

Key words: *tephra, submarine environment, timing, correlation.*

Volcanic explosive eruptions produce large volumes of pyroclasts that can travel great distances away from the source vents. In submarine environments, after deposition, volcaniclastic deposits are usually diagenetically altered to clay minerals (smectite group) giving rise to the formation of bentonites. Considering that pyroclastic layers are practically instantaneously deposited they represent ideal isochron horizons for across-basin correlations and also are of high tectono-magmatic significance for the region where they occur. Here we present a preliminary study of an Albian interval rich in bentonite layers (up to more than 200 layers in a single succession) interbedded with turbidite deposits. This interval belongs to the Black Flysch Group (Middle Albian-Lower Cenomanian) and extends along the northern margin of the Basque-Cantabrian basin. Most of the identified bentonites are 0.1 to 2 cm-thick, tabular shaped layers with flat sharp basal contacts and irregular bioturbated upper contacts. Their internal structure is usually normal gradation, but un-ordered bentonites also occur. They are mainly composed of ash- to fine lapilli-sized clasts of trachyte lithics, feldspar crystals and crystal fragments, and accidental sedimentary lithics. We interpret these layers as fallout pyroclastic deposits emplaced in a deep submarine environment. Observed relationships with their host sediments point out that two key factors controlled the preservation of bentonite beds in the studied stratigraphic successions, namely bioturbation degree and erosion induced by sediment gravity flows. Dating of the sedimentary successions and heterogeneous vertical distribution of the bentonite layers indicate that: i) the bentonite-bearing interval was contemporaneous along the whole northern margin of the basin, representing a chronostratigraphic marker; ii) a discrete episode of intense trachytic explosive volcanism developed during the Late Albian p.p.; and iii) explosive volcanism rates were not constant but showed a high temporal variability.

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Contouritic facies on the Guadiaro-Baños drifts (Alboran Sea, SW Mediterranean): The role of intermediate and deep Mediterranean bottom currents over the last 29 kyr

Belén Alonso[1]*, David Casas[1], Carmen Juan[2], Nieves López-González[3], Isabel Cacho[4], Gemma Ercilla[1], Blanca Ausín[5], Patricia Bárcenas[2], Desirée Palomino[2], Mariano Yenes[5], José Nespereira[5], Pilar Mata[6]

[1] Institut de Ciències del Mar ICM-CSIC, Passeig Marítim de la Barceloneta 3-49, 08003 Barcelona, Spain, belen@icm.csic.es
[2] Instituto Español de Oceanografía, CSIC-Centro Oceanográfico de Cádiz, Puerto Pesquero, Muelle de Levante s/n, 11006 Cádiz, Spain.
[3] Instituto Español de Oceanografía-CSIC, Centro Oceanográfico de Málaga, Puerto Pesquero s/n, 29640 Fuengirola, Málaga, Spain.
[4] Facultad de Ciencias de la Tierra, Universidad de Barcelona, Martí Franques s/n, 08028 Barcelona, Spain.
[5] Departamento de Geología, Universidad de Salamanca, Plaza de los Caídos s/n, 37008 Salamanca, Spain.
[6] Instituto Geológico y Minero de España-CSIC, Ríos Rosas 23, 28003 Madrid, Spain.

Key words: *bottom currents, contourites, glauconite, drifts, terrace.*

The recent sedimentological properties of contouritic features (terrace and drift) developed between the Guadiaro and Baños submarine canyons (NW Alboran Sea) have been characterised using sedimentological (texture, median grain size, sorting, terrigenous UP10 fraction), compositional (sand fraction composition and Zr/Rb ratio), and chronostratigraphic ($\delta^{18}O$ and AMS ^{14}C) data. Ten sediment cores retrieved from 319 to 914 m water depth across the margin (from the upper slope to basin environment) sampled a contourite terrace, and plastered, sheeted and elongated separated contourite drifts formed under the influence of intermediate and deep Mediterranean water masses (MWs). Integration of this data reveals that the terrace and Guadiaro-Baños drift deposits have comprised mainly mud, silt, sandy-silt and silty-sand contourite facies for the last 29 kyr. The vertical distribution of these facies allows us to identify mainly bi-gradational sequences composed of a coarsening up and a fining up sub-sequence which are clearly reflected in the Zr/Rb ratio. Correlation of physical and chemical palaeocurrent proxies after core chronostratigraphy reveals comparable millennial and centennial patterns with maximum peaks at Heinrich Events H3, H2, H1, and the Younger Dryas. This implies a concomitant deposition of a uniform layer of coarse-grained sediments on the drifts located on the lower slope and in the basin during those cold periods. The differences in sedimentation rate (SR) and facies among the regional contourite sequences from the upper continental slope to the basin allow us to establish two depositional models: Model 1, on the slope, involves silty contourites with a low SR (< 9 cm/kyr) and the singular presence of glauconite on the upper slope; Model 2, at the base of slope and in the basin, is characterised by muddy contourites with a higher SR (up to 37.4 cm/kyr). These models seem to be controlled mainly by the spatial and temporal dynamics of intermediate and deep Mediterranean water masses and sediment supply.

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Disentangling the Early Pleistocene $\delta^{18}O$ signal at the Iberian margin

Montserrat Alonso-García[1*], Emília Salgueiro[2, 3], Ana Lopes[1, 2], Cesar N. Rodriguez-Díaz[4], H. Kuhnert[5], J. Groeneveld[5], Antje H. Voelker[2, 3], Teresa Rodrigues[2, 3], Francisco J. Sierro[1], Fátima Abrantes[2, 3]

[1*] University of Salamanca, Department of Geology- Paleontology, Pza de los Caídos s/n, 37008 Salamanca, Spain, montseag@usal.es

[2] Instituto Português do Mar e da Atmosfera (IPMA), Avda Alfredo Magalhães Ramalho 6, 1495-006 Lisboa, Portugal.

[3] Centro de Ciências do Mar (CCMAR), Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.

[4] Institut de Ciencies del Mar, Dpto. Marine Biology and Oceanography, Passeig Marítim de la Barceloneta, 37-49, 08003 Barcelona, Spain.

[5] MARUM & University of Bremen, 28359 Bremen, Germany.

Key words: *benthic foraminifera, Mg/Ca, $\delta^{18}O$, MOW, AAIW.*

During the Early Pleistocene remarkable glaciations started to develop in the Northern Hemisphere and the obliquity-related (41 ka) climatic cycles emerged. During this interval it is commonly accepted that the Mediterranean Outflow Water (MOW) started to inject high salinity water to the North Atlantic Deep Water (NADW) enhancing the Atlantic Meridional Overturning Circulation. However, little is known about the structure and variability of the bottom water masses at the Iberian margin during this interval.

Here we present a study based on benthic foraminifer paired $\delta^{18}O$ and Mg/Ca analyses from Site U1391 (37°21.5′N; 9°24.6′W, 1085 m water depth), located at present under the path of MOW, to document physico-chemical changes encompassing the interval *ca.* 2.6-2.1 Ma. Stable isotopes ($\delta^{18}O$, $\delta^{13}C$) and trace element analyses were performed on *Cibicidoides pachyderma* (Rzehak, 1886) in order to reconstruct bottom water temperature (BWT) and changes in the $\delta^{18}O$ of the bottom water ($\delta^{18}Ow$), which indicates salinity changes. Our results show that *C. pachyderma* recorded heavy $\delta^{18}O$ values during some intervals that do not correspond with the glacial periods, according to the alkenone-based sea surface temperature record of Site U1391. Those intervals show remarkably cold BWT and low $\delta^{18}Ow$ (an indicator of low salinity). This fact may indicate that a different water mass than MOW or NADW (which are the two dominant bottom water masses at the Iberian margin) was present at Site U1391. We propose that the Antarctic Intermediate water (AAIW) may be influencing the Iberian margin and modifying the *C. pachyderma* $\delta^{18}O$ record. Consequently, the *C. pachyderma* $\delta^{18}O$ record is not always reliable as an indicator for glacial-interglacial variability because the ice volume signal is overprinted by the different signatures of the water masses.

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Local background estimation of trace elements in sediments. A methodological approach in the land-to-ocean boundary

Miguel Ángel Álvarez-Vázquez[1*], Gonzalo Farinango[2], Ricardo Prego[2]

[1*] Área de Xeografía Física, Grupo GEAAT, Universidade de Vigo, Ourense, Spain, mianalva@uvigo.es
[2] Instituto de Investigaciones Marinas (IIM), CSIC, Vigo, Spain.

Palabras clave: *reference element, contamination, "Anthropocene", Ulla-Arousa system.*

Background estimation is a critical step in any trace element contamination assessment on sediment composition. The broadly used comparison with global or regional references is a quick tool, very powerful as an exploratory approach but, it disregard local anomalies that can be attributed to the natural variability of compositional data. Accordingly, a local assessment of background is always advisable.

When considering the land-to-ocean boundary, it is common to address a variety of sedimentary environments with their particular complexities (i.e. bedrock rivers, alluvial rivers, estuaries, coastal-oceanic areas). A scientific question can be proposed: Is it possible to apply a single approach to the whole area from the headwaters to the ocean? In order to give an answer, several background estimation techniques were applied and compared (i.e. univariate: Tukey fences, Carling fences, 2-sigma, probability plots; bivariate: least-squares regression and robust regression). The study relies in 78 surface sediment samples from the Ulla River and nearby area of the Ria of Arousa (NW-Iberian Peninsula) covering three mayor domains: continental (n = 30), estuarine (n = 12) and coastal-oceanic (n = 36). It is presented the example of the common contaminants As and Pb.

All the methods produced similar results in the background estimation, broadly averaging 14-17 mgAs kg^{-1} and 31-36 mgPb kg^{-1} with a similar dispersion for both, calculated as relative standard deviation, of about ±24-43 %. The As and Pb contents in the whole area are enriched if related to the global reference of the upper continental crust, but similar to the regional reference content in soils developed over granitic rocks. Bivariate techniques present as advantage a slightly better fit. However, the use of Al as reference element (very common and often used automatically) performs worst on headwaters samples (bedrock rivers). Uranium, probably due to its linkage with granites, showed in this particular case a good potential as reference element for the whole area (from the continental headwaters to the oceanic domain). Nevertheless, none background estimation technique should be automatically applied before being empirically tested.

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Los campos de pockmarks en el sistema de cañones submarinos de Capbreton

Beatriz Arrese[1*], Irene Díez-García[1], María Gómez-Ballesteros[1], Ibon Galparsoro[2]

[1*] Instituto Español de Oceanografía – CSIC, C/ Corazón de María 8, 28002 Madrid, beatriz.arrese@ieo.es
[2] AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Herrera Kaia, Portualdea z/g, 20110 Pasaia, Spain.

Palabras clave: *cañón de Capbreton, geomorfología, pockmark.*

En el marco del proyecto LIFE-IP-INTEMARES, se está realizando la caracterización de un sector del sistema de cañones submarinos de Capbreton, localizado en la región oriental del mar Cantábrico (golfo de Vizcaya), con el fin de mejorar el conocimiento para la declaración de nuevos espacios marinos protegidos de la Red Natura 2000 por su importancia para los diversos hábitats que los forman. Durante los años 2019 y 2020 se llevaron a cabo dos campañas de investigación oceanográfica, en las cuales se prospectó una zona de interés de 3850 km^2, (concretamente, un sector del curso meandriforme del cañón principal de Capbreton). Se han obtenido datos batimétricos, de reflectividad acústica del fondo marino y perfiles sísmicos de alta resolución del sub-suelo marino, así como muestras de roca y sedimentos, además de transectos de vídeo. Así, se han podido observar los cañones tributarios que atraviesan el talud continental, con orientación perpendicular a la línea de costa, y las plataformas intertributarias que presentan destacables campos de pockmarks (depresiones circulares o elípticas asociadas a escapes de fluidos).

La batimetría de alta resolución obtenida para la zona ha permitido que, mediante técnicas manuales y semi-automáticas, se cartografíen más de 3000 pockmarks en un rango profundidades comprendido entre 400 y 1200 m. Se han estudiado las características principales de estos pockmarks (morfometría, localización, densidad, etc.) con el objetivo de conocer mejor su génesis y su relación con la evolución geológica de la zona.

Estas morfologías, de dimensiones variables entre 20 y 550 m de diámetro y con depresiones que alcanzan los 80 m, que se presentan de forma aislada, agrupada, múltiple (conteniendo unas a otras) o alineadas según orientaciones preferentes, sugieren un posible control tectónico. En ocasiones, aparecen conectados o asociados a zonas con pendientes inestables (en determinados sectores) donde se ha observado una gradación de tamaño. En los perfiles sísmicos de alta resolución adquiridos, se han podido localizar pockmarks tanto en la superficie del fondo marino, como sepultados dentro de los estratos sedimentarios, donde han quedado reflejados como paleo-pockmarks, actualmente cubiertos de sedimento.

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Heavy metal tolerance in marine bacteria isolated from coastal sediments of the Bay of Biscay

Uxue Arrizabalaga-Luzuriaga[1], Blanca Rincón-Tomás[1, 2], Carla Perez-Cruz[1], Eli Bilbao[1], Laura Alonso-Sáez[1*]

[1*] AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Sukarrieta, Spain, lalonso@azti.es
[2] IGME, Instituto Geológico y Minero de España (IGME-CSIC), Madrid, Spain.

Key words: *Pollution, toxicity, MIC, bacteria, sediments.*

Heavy metals are environmental pollutants introduced into the environment by natural or anthropogenic sources. Metal contamination in marine environments is an issue of global concern because of its possible effects on ecosystems and human health. Harmful effects can result from the toxicity of metals, altering macro- and microbiological communities by inducing oxidative stress and interfering with protein folding and functioning. Many microorganisms have developed resistance mechanisms to counteract heavy metals toxic effects, e.g., efflux of toxic ions from bacterial cells, enzymatic transformation of metals to species with lower toxicity, and their sequestration into biochemical complexes. We isolated bacteria from heavily polluted marine sediment samples from the North coast of Spain and we tested their growth in five different heavy metals to investigate their potential tolerance to them. Our objective was to analyse which levels of these pollutants marine sediment bacteria are typically able to tolerate, and whether there are significant differences between distinct bacterial taxa. Seven strains were growth in 3 different metal concentrations (3mM, 1mM and 0.1mM) and a control, to determine their Minimum Inhibitory Concentration (MIC). All strains were resistant to Mn^{2+} (MIC > 3mM), but a lower resistance to Cu^{2+}, Zn^{2+} and Co^{2+} was observed (MIC < 3mM). We also observed a longer lag-phase in several strains (affiliated with *Pseudomonas sp.* and *Marinobacter sp.)* when exposed to toxic metal concentrations, suggesting that they need to express mechanisms of tolerance before initiating growth. In future work we plan to study the physiological mechanisms involved in the heavy metal tolerance of these strains during different growth phases, as well as the presence of molecular markers for metal detoxification in their genomes

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Crustal structure across the São Miguel Island (Azores, North Atlantic) and tectonic implications

L. Batista[1, 2], C. Hübscher[3], P. Terrinha[1, 2], L. Matias[2], A. Afilhado[2, 4], A. Loureiro[2], B. Weiß[5]

[1] Instituto Português do Mar e da Atmosfera IPMA, I.P., Lisbon, Portugal, luis.batista@ipma.pt
[2] Instituto Dom Luiz IDL, University of Lisbon, Portugal.
[3] Center for Earth System Research and Sustainability, Institute of Geophysics, University of Hamburg. Germany.
[4] Instituto Superior de Engenharia de Lisboa ISEL, Lisbon, Portugal.
[5] Bundesamt für Seeschiffahrt und Hydrografie, Hamburg.

Key words: *Azores Plateau, Terceira Rift, Pate boundary, Underplating.*

The crustal and uppermost lithospheric mantle of the São Miguel Island in the Azores Plateau is investigated by means of refraction and wide angle reflection seismic. The study was performed using 18 Ocean Bottom Seismometers and 7 land stations along a 160 km long profile that cuts across São Miguel Island and the Terceira Rift and additional multichannel seismic reflection on the top of the refraction profile. The P-wave velocity model shows that the São Miguel Island is made up of 5 crustal layers, including a sedimentary sequence varying between 150 m and 1500 m of thickness. The Moho discontinuity lies at 15 km of depth underneath the island and at 11 km outside the island and rift, respectively. The crystalline crust includes thickened upper and lower crusts and, a lens-shaped, 125 km-long layer with a maximum thickness of 2.5 km and a velocity of 7.6 km/s at the base of the crust. We speculate that this layer consists of gabbro cumulates, formed by magmatic underplating.
Extensional southwards directed simple shear across the whole crust and the Moho discontinuity – the São Miguel Deep Ductile Deformation Zone – causes uplift and northwards tilting of the island associated to which a 30 km landslide on the north flank of the island is reported. Decoupling between ductile deformation in depth and brittle deformation in the shallow levels caused the formation of a rift half-graben filled in with 1500 m of sediments and various mass transport deposits. São Miguel Deep Ductile Deformation Zone is considered as a diffuse plate boundary where deformation is accommodated by brittle mechanisms (seismicity) and plastic flow (lateral thickness variation of the lower crust).

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The 1755 CE Lisbon tsunami deposits in El Palmar de Vejer, Spain

Piero Bellanova[1*], Mike Frenken[1], Lisa Feist[1], Jan Schwarzbauer[2], Klaus Reicherter[1]

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany, p.bellanova@nug.rwth-aachen.de

[2] Institute for Geology and Geochemistry of Petroleum and Coal, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany.

Key words: *tsunami inundation, multi-proxy approach, sedimentology, natural hazards.*

On November 1st, 1755 CE, the Lisbon tsunami caused major inundations along the coastline of the Gulf of Cadiz. Witness of the destruction and power of the tsunami inundation was the town of Conil de la Frontera (Spain). South of the town, the Torre de Castilnovo (constructed in the 13th century) presents damage marks in the walls up to 4-8 m above sea level to this day and was partially rebuilt as a tuna factory afterwards. Located south of the tower is the topographically flat alluvial flood plain (playa) of the Conilete Creek in El Palmar de Vejer – the field survey area of this study.

A multi-proxy approach, including, geophysical, sedimentological, paleontological and geochemical methods was successfully conducted at this field site in order to detect, differentiate and analyze deposits of the 1755 CE Lisbon tsunami. Several cores were obtained and a 3 x 3 m large L-shaped and ca. 1 m deep trench was excavated to study the sandy tsunami deposit in its entirety.

The sediment of the detected tsunami layers contrasts to the surrounding background strata by their geophysical properties, by its grain size as well as paleontological and geochemical composition (both organic and inorganic). The sedimentological and geochemical features point to three successive tsunami-induced wash-over episodes, each one followed by its backwash phase, correspondent to the historical reported waves. The maximum inundation distance along the alluvial flood plain of the Conilete Creek is ca. 1-1.3 km inland while the inundation distance along the Rio Salado (Conil de la Frontera) was significantly further inland with about 2.5 km. Overall, the field site of El Palmar de Vejer presents ideal preservation conditions to study the deposits and local effects of 1755 CE Lisbon tsunami.

Offshore tsunami backwash deposits – hints through organic-geochemical analysis

Piero Bellanova[1*], Jan Schwarzbauer[2], Lisa Feist[1], Pedro Costa[3], Juan I. Santisteban[4], Klaus Reicherter[1], the M152 scientific Team

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany, p.bellanova@nug.rwth-aachen.de

[2] Institute for Geology and Geochemistry of Petroleum and Coal, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany.

[3] Earth Sciences Department, Faculty of Sciences and Technologies, University of Coimbra, Portugal.

[4] Department of Geodynamics, Stratigraphy and Paleontology, Fac. Geological Sciences, Complutense University of Madrid, Spain.

Key words: *tsunami backwash deposits, 1755 CE Lisbon tsunami, offshore, organic geochemistry.*

Little is known about offshore tsunami backwash deposits. Their sedimentary processes, impact on benthic life and preservation potential are as yet unexplored. Few offshore sedimentary archives have been studied for tsunami research. One of these is the shelf record of southwestern Iberia, where the M152 RV METEOR expedition sampled a coast-perpendicular transect off the Algarve coast (water depths: 65-114 m). When tracing the offshore sedimentary footprint of the 1755 CE Lisbon tsunami backwash, a predecessor tsunami layer has been identified. While records of the 1755 CE tsunami and a potential predecessor (in Iberia) are well documented onshore, the offshore record of the sedimentology and dynamics of the backwash are as yet unexplored. At least two tsunami deposits (1755 CE and ca. 3400 cal. BP) were detected in vibracores obtained from the Algarve shelf seafloor. A multi-proxy approach allowed to identify and differentiate these event deposits from the background sedimentation. Organic-geochemical biomarker proxies, such as *n*-alkanes, polycyclic aromatic hydrocarbons, terpenes and *n*-aldehydes, were used for a clear identification of the terrestrial-influenced backwash. Further, the organic-geochemical signature of the onshore deposits of the 1755 CE tsunami from the famous Boca do Rio site were compared with the proxies detected in the offshore backwash deposits. In the latter, the biomarker assemblage is less distinctive, but still shows a significant discrimination from the surrounding sediments.

Therefore, the Algarve shelf is a reliable archive for Holocene tsunami imprints. It may extend the onshore record with its much lesser preservation potential due to subaerial erosion and present-day coastal morphology being established only since the last four millennia. The organic-geochemical approach has been proven to be a vital tool in onshore tsunami research but it is also able to identify tsunami backwash deposits and to assess related sedimentary and environmental changes in the offshore record.

Dispersion of microplastics from the Mondego estuary to the open ocean

Filipa Bessa[1*], Andreia Guilherme[2], Beatriz Agante[1], Paula Sobral[2], Elisabete Valente[3], Carla Palma[3]

[1*] University of Coimbra, Department of Life Sciences, MARE - Marine and Environmental Sciences Centre, Coimbra, Portugal, afbessa@uc.pt

[2] Marine and Environmental Sciences Centre (MARE), NOVA School of Science and Technology, NOVA University Lisbon, Portugal.

[3] Division of Marine Geology, Instituto Hidrográfico, Lisbon, Portugal.

Key words: *Plastic pollution, Waters, Sediments, Biota, Land-ocean interface.*

The recent acceleration of microplastic pollution has increased the need to develop novel collaborative tools for synergistic problems affecting coastal and oceanic ecosystems. The i-plastic project (https://i-plastic.net) aims to comprehensively ascertain the fate of microplastics (5 mm to 1 µm) at the land-ocean interface under distinct flow and climate regimes, and their dispersion to the open ocean. This overall objective will be addressed through the study of three estuaries located in Brazil, Portugal and Spain, In Portugal, in-situ seasonal monitoring of microplastics in the waters, sediments and biota started in the spring of 2021 and is ongoing in the Mondego River system, covering 4 stations inside the estuary and 20 stations in coastal adjacent areas. In parallel, mussels were collected along the same gradient (30 individuals *per* station), to assess their use as potential bioindicators of microplastics. The results obtained in the campaigns of spring 2021 and autumn 2021 show that all the samples from the waters (surface and the water column) and the sediments are contaminated with microplastics. The surface waters of Mondego estuary presented, on average, a concentration of about 5 particles per m^3 (higher than that recorded in the open sea ~ 3 particles/m^3) but higher concentrations were also detected in the water column rather than in the surface water with a maximum value of 58.2 particles/m^3 detected near wastewater treatment plant outlets. The particles are mainly fragments and fibers, while PET (polyethylene terephthalate) and nylon are the main polymers found. These results demonstrate that WWTP and docks are the main source of microplastics into the estuary and marine environment. For biota, to date, 494 particles were extracted from 180 mussels and a positive correlation was found between the levels of microplastics in waters and in mussels along the estuarine and open sea areas. These data will inform our understanding of the spatial distribution of microplastics in transitional systems, the role of mussels in microplastic budgets, and models for the fate of microplastic pollution in the Atlantic Ocean.

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Identificación preliminar de zonas vulnerables en la costa vasca: análisis a través de modelos digitales del terreno

Peru Bilbao Lasa[1*], Irantzu Álvarez Gonzalez[2], Arantza Aranburu Artano[1], Miren del Val[1, 3], Martin Arriolabengoa Zubizarreta[1], Eneko Iriarte Aviles[4]

[1*] Departamento de Geología, Facultad de Ciencia y Tecnología, Universidad del País Vasco/ Euskal Herriko Unibertsitatea, Bº Sarriena s/n, 48940, Leioa, peru.bilbao@ehu.eus

[2] Departamento de Expresión Gráfica y Proyectos de Ingeniería, Escuela de Ingeniería de Bilbao, Universidad del País Vasco/ Euskal Herriko Unibertsitatea, c/ Pitxitxi 2, 48013 Bilbao.

[3] Centro Nacional de Investigación sobre la Evolución Humana (CENIEH). Paseo Sierra de Atapuerca 3. 09002 Burgos.

[4] Departamento de Historia, Geografia y Comunicación, Universidad de Burgos, Pl. Misael Bañuelos s/n, 09001 Burgos.

Palabras clave: *Calentamiento global, retroceso costero, Lidar, País Vasco.*

Las zonas litorales son áreas muy dinámicas, que se van modelando debido a los procesos de erosión, transporte y acumulación de sedimentos. El motor principal de estas transformaciones es la energía proveniente del mar, por medio del oleaje, las mareas y las corrientes litorales. Algunos de los procesos que modifican el litoral son los derrumbes. Estos son generados bien debido a la acción erosiva del oleaje que crea un socavón en la base de los acantilados e inestabiliza la ladera; o bien debido a la precipitación de lluvia que al infiltrarse satura el suelo y provoca el deslizamiento de tierra pendiente abajo. El calentamiento global está produciendo un incremento en la periodicidad e intensidad de las tormentas y oleajes extremos, así como en la frecuencia e intensidad de las precipitaciones, los cuales pueden provocar un aumento de dichos procesos en la franja costera.

La metodología empleada para detectar las zonas más susceptibles a la erosión costera y a experimentar movimientos gravitacionales, se aplica al caso de la costa del País Vasco. Para ello, se han comparado los modelos digitales del terreno de los años 2008 y 2017, disponibles en la Infraestructura de Datos Espaciales del Gobierno Vasco.

En un análisis preliminar se ha podido constatar la validez de esta técnica para detectar las variaciones del terreno. A modo de ejemplo, destacan los grandes deslizamientos de tierra detectados en el litoral del Geoparque de la Costa Vasca, localizándose el de mayores dimensiones al oeste del pueblo de Zumaia (Gipuzkoa).

Sin embargo, esta técnica no proporciona información precisa en algunas cuestiones como por ejemplo, las tasas anuales de retroceso, o el momento exacto de cuando se produjo un deslizamiento, ni tampoco abarca en este caso un lapso temporal muy extenso. Aun así, se considera que este procedimiento puede ser empleado para determinar de manera preliminar qué zonas pueden ser las más vulnerables. Las evidencias detectadas mediante esta metodología que se nutre de datos públicos, pueden servir de aproximación base para la toma de medidas de adaptación o mitigación para el futuro.

Nuevos depósitos costeros del último interglaciar en el margen cantábrico

Peru Bilbao Lasa[1*], Irantzu Álvarez Gonzalez[2], Arantza Aranburu Artano[1], Miren del Val[1, 3], Martin Arriolabengoa Zubizarreta[1], Eneko Iriarte Aviles[4]

[1*] Departamento de Geología, Facultad de Ciencia y Tecnología, Universidad del País Vasco/ Euskal Herriko Unibertsitatea, Bº Sarriena s/n, 48940 Leioa, peru.bilbao@ehu.eus

[2] Departamento de Expresión Gráfica y Proyectos de Ingeniería, Escuela de Ingeniería de Bilbao, Universidad del País Vasco/ Euskal Herriko Unibertsitatea, c/ Pitxitxi 2, 48013 Bilbao.

[3] Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), Paseo Sierra de Atapuerca 3, 09002 Burgos.

[4] Departamento de Historia, Geografía y Comunicación, Universidad de Burgos, Pl. Misael Bañuelos s/n, 09001 Burgos.

Palabras clave: *Nivel del mar, Geocronología, Cuaternario, País Vasco, Cantabria.*

Una de las principales preocupaciones actuales en relación al calentamiento global se refleja en el aumento del nivel del mar, el cual podría ser de varios metros superior al actual, en función de los diversos escenarios que se manejan para el futuro. Sin embargo, este proceso no es exclusivo del calentamiento actual. De hecho, el Cuaternario se caracteriza por la alternancia de épocas glaciares e interglaciares que han dado lugar a importantes variaciones en el nivel del mar.

Durante el último máximo glacial el nivel del mar llegó a estar unos 120 m por debajo del nivel actual. Sin embargo, en algunas épocas interglaciares, llegó a estar por encima de la cota actual, dejando su impronta en el terreno costero, bien en forma de depósitos de playa o simplemente superficies de erosión. A lo largo del margen cantábrico se han caracterizado varios depósitos de este tipo. En este trabajo, se presentan nuevos datos correspondientes a estos periodos de nivel del mar alto.

El depósito principal está localizado en la playa de Karraspio (Mendexa, País Vasco). Las características geológicas observadas en el afloramiento son muy similares a las observadas en otros lugares como Oyambre (Cantabria). De base a techo se diferencian una superficie de erosión generada sobre el flysch del Cretácico Inferior, tapizada por un nivel de gravas redondeadas de tamaño centimétrico y decimétrico. La secuencia culmina con una importante acumulación de arena consolidada que, tras ser datada por medio de la luminiscencia estimulada ópticamente (LOE), aporta una edad cercana a 106.7 Ka ± 12.2.

Otro depósito analizado se encuentra en la playa de Ostende (Castro-Urdiales), donde se observan gravas redondeadas a techo de algunas cuevas. En este caso, estos materiales están tapizados por espeleotemas que tras ser datadas por U/Th han aportado edades de 105383 Ka ± 10764.

Sabiendo que hace ~116 – 128 Ka el nivel del mar estuvo ~6 – 9 m por encima del nivel actual, estos depósitos descritos en este trabajo podrían corresponder al último interglacial denominado MIS5e.

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Impact of gasohydrothermal vents on a Cretaceous shallow-marine carbonate environment and biota replacement (western Basque-Cantabrian Basin)

Arantxa Bodego Aldasoro[1*], Eneko Iriarte Avilés[2], Martin Ladrón de Guevara[1], Laura Damas-Mollá[1], Arantza Aranburu Artano[1]

[1*] Dpt. of Geology, Faculty of Science and Technology, University of the Basque Country (UPV/EHU), 48940 Leioa (Bizkaia), Spain, arantxa.bodego@ehu.eus

[2] Laboratory of Human Evolution-IsoTOPIK Stable Isotope Laboratory, Dpt. of History, Geography & Communication, Edificio de I+D+i, Universidad de Burgos, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain.

Key words: *Albian, rift system, hydrothermalism, carbonate ramp.*

In the western Basque-Cantabrian Basin, lower Albian (Lower Cretaceous) limestones record the evolution of a shallow-marine carbonate ramp in the context of the Cretaceous Basque-Cantabrian-Pyrenean Mesozoic rift system.

The occurrence in this limestones of i) micritic (peloidal *wackestone-packstone*) facies, ii) atypical urgonian biota (scarce sponges, equinoderm fragments, and abundant ostracods and nektonic biota such as ammonites, belemnites and planktonic foraminifera), iii) their geometric relationship with the underlying limestone unit, and iv) the presence of micritic, spastic calcite and silica-dolomitic fills in some outcrops suggest an anomalous depositional environment within the shallow-marine carbonate ramp system during the deposition of this micritic limestone unit.

The sedimentological and petrological characterisation, completed with stable isotopic ($\partial^{13}C$, $\partial^{18}O$ and $\partial^{87}Sr$) and elemental analysis, suggest that the deposition of the micritic unit occurred under the presence of warm fluids enriched in anomalous chemical elements. The stratigraphic and structural study of the area indicate that extensional synsedimentary faults acted as escape conduits for relatively deep hydrothermal fluids that impacted in the unconsolidated sea-bottom causing an stressful environment for the typical urgonian biota and promoting its disappearance and replacement by nektonic biota and ostracods.

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Estuarine sediment contamination in the Southwest of Spain through bivalves

Estefanía Bonnail[1], Pablo Cruz-Hernández[2*], Rocío Antón-Martín[3], Inmaculada Riba[3], Tomás Ángel DelValls[4]

[1] Centro de Investigaciones Costeras de la Universidad de Atacama, Avenida Copayapu 485, Copiapó (Atacama), Chile.

[2*] Departamento CITIMAC, Facultad de Ciencias, Universidad de Cantabria, Avda. de los Castros 48, 39005 Santander, pablo.cruz@unican.es

[3] Facultad de Ciencias del Mar y Ambientales, Universidad de Cádiz, Polígono Río San Pedro s/n, 11510 Puerto Real (Cádiz), España.

[4] Department of Ecotoxicology, Santa Cecília University (UNISANTA), Santos, São Paulo, Brazil.

Key words: *human activities, sediments pollution, bioaccumulation, clams, contamination degree, bioaccumulation factor.*

Estuaries illustrate the confluence of human activities upstream as well as other activities from the coastal edge. Contamination remains over sediments and may be transferred to biota, since buried molluscs interact with the polluted sediments. This study analysed the contamination from different estuaries from the Southern Iberian Peninsula. With that purpose, surface sediment samples with different human impact degree were examined for several elements (Cd, Co, Cu, Hg, Ni, Pb, and Zn). Additionally, bioaccumulation in clams (*Ruditapes philippinarum*) after several days of exposure under laboratory conditions was also performed and controlled. The contamination degree index pointed out the most contaminated stations were in Huelva; and the least contaminated station was located in the inner bay of Cádiz, and the outer stations of the estuaries from Guadiana, Guadalquivir, Palmones and Guadarranque. With exception of Huelva stations, all sampling points were characterized by a low contamination for As and Cd, and from moderate to very contamination of Cu. Best biomonitoring results (correlation of concentrations in sediment vs. biota) were found for Pb > Cd > Zn > Cu > As >Hg, but was not significant for Ni and Co. The results revealed that among all the analysed points, Huelva Estuary sediments contain the highest concentration of almost every element analysed. Regarding the soft tissues of the clams, Zn, Cu, and As were highly bioaccumulated. Huelva estuary and Barbate exposed values above the average. This fact matches with the suggestion that a higher concentration of heavy metal(loid)s will be transferred to organisms living in areas where the sediments are more polluted.

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Identification of longline fishing grounds using Machine Learning for benthic habitat impact assessment

Daniel Cano Fernández[1*], José Rodríguez Gutierrez[1], Marta Sainz Bariain[1], Augusto Rodríguez Basalo[1], Antonio Punzón Merino[1]

[1*] Instituto Español de Oceanografía (IEO), CSIC, Promontorio San Martín s/n, 39004 Santander, daniel.cano@ieo.es

Key words: *A.I.S., artificial intelligence, seabed integrity, Avilés canyon, fisheries.*

The diagnosis of the impact of bottom fisheries on benthic habitats has focused mainly on the study of trawl fisheries, fundamentally because of the evidence of their impact, because of their economic importance and because the available information allows precise estimates of the impacted area. Longline fisheries are very important in the Atlantic Iberian margin and, due to their significant development in the slope area, their interaction with RN2000 benthic habitats is great. The available information (VMS) does not yet allow a precise spatial quantification of their impact, which should be related to the area occupied or swept by a longline and the setting time. The IMPALHA project is going to address this work for the Avilés canyon area, in order to be able to relate the sensitivity of the habitats and the different levels of real longline pressure.

The development of new tools for the assessment of human pressures on marine ecosystems involves the use of artificial intelligence and machine learning. In this preliminary work we explore the possible use of three supervised learning methods; Support Vector Machines, Decision Trees and Random Forest trained on high resolution data (A.I.S.) and we will evaluate the different models and their ability to predict fishing events for the case of bottom longline.

These results will allow the identification of fishing grounds whose definition is essential in the estimation of fishing time as a measure of effort. This information, along with estimates of the area impacted by longline fishing, will make it possible to evaluate the area of benthic habitats adversely affected.

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Characterization and controlling factors of incised valley systems on a continental margin with insignificant fluvial inputs: Algarve continental shelf, Gulf of Cadiz.

A. Carrión-Torrente[1, 2]*, F.J. Lobo[1], A. Puga-Bernabéu[2], M. Luján[3], I. Mendes[4], T.J.J. Hanebuth[5], S. Lebreiro[6], M. García[7], M.I. Reguera[6], L. Antón[6], D. Van Rooij[8], J. Goff[9], J. Cerrillo-Escoriza[1, 2]

[1] Instituto Andaluz de Ciencias de la Tierra, CSIC-University of Granada, Armilla, Granada, Spain, alvct@iact.ugr-csic.es
[2] Department of Stratigraphy and Paleontology, University of Granada–UGR, Granada, Spain.
[3] Department of Earth Sciences, University of Cadiz, Puerto Real, Spain.
[4] Centre for Marine and Environmental Research–CIMA, Universidade do Algarve, Faro, Portugal.
[5] Department of Coastal and Marine Systems Science, Coastal Carolina University, Conway, SC, USA.
[6] Instituto Geológico y Minero de España-Centro Nacional, Spanish Research Council–CSIC, Madrid, Spain.
[7] Oceanographic Centre of Cadiz, Spanish Institute of Oceanography–IEO, CSIC, Ministry of Science and Innovation, Cadiz, Spain.
[8] Renard Centre of Marine Geology, Ghent University, Krijgslaan 281 (S8), 9000 Gent, Belgium.
[9] Institute for Geophysics, The University of Texas at Austin, Austin, Texas, USA.

Palabras clave: *Cuaternario, paleovalles, plataforma continental, sísmica, sedimentos.*

The identification of drowned paleovalleys provides valuable insight into the hydrological and sedimentary dynamics of ancient fluvial systems that were established on modern shelves during previous time intervals. This study is based on a combined seismic stratigraphic and sedimentological analysis, focusing on evidences of incised paleovalley systems in the eastern Algarve shelf (Portugal) offshore the Gilão-Almargem Estuary, a region that presently receives minor fluvial supply. The main aim of the study is to establish the controlling factors that have determined the formation of these valley systems.

The spatial distribution and architecture of the paleovalleys were interpreted based on a grid of seismic profiles with different resolutions. Likewise, a sediment core obtained from the more proximal paleovalley system was subjected to grain size and carbonate content analyses, providing useful information about the dominant sedimentary processes during the most recent stage of valley infilling. The chronostratigraphic framework was constructed based on regional seismic horizons defined in previous studies and complemented with two AMS 14C dates obtained from bivalve shells.

On the middle shelf, a paleovalley system showing at least four excavation phases was found. Correlation of the excavation surfaces with the regional chronostratigraphic framework reveals that these excavation phases occurred prior to 0.9 Ma. In such setting, the initiation of the paleovalley system seems to have been controlled by a system of sub-vertical faults. Along the inner shelf off the Gilão River mouth, a second paleovalley system composed of several incised valley features was identified. These valley features exhibit two major excavation phases. In the sediment core, partially cemented sands are overlain by sandy gravels with ages of 9879.5-10248 cal. yr BP, finally covered by structureless muddy sands. The available evidence suggests that the formation of this proximal incised valley system was mainly guided by glacial cycles, whereas its recent most evolution was influenced by older indurated barrier systems and back-barrier tidal processes.

The use of passive samplers as alternative for the impact assessment of dredging activities in port waters

H. Carvalhal[1], I. Menchaca[2*], M.J. Belzunce-Segarra[2], J. Franco[2], J. Larreta[2], N. Montero[2], G. Rodríguez[2]

[1] Science and Technology Faculty, University of Basque Country, Leioa, Spain

[2*] Investigación Marina, AZTI (BRTA), Pasaia, Spain, imenchaca@azti.es

***Key words**: passive sampling, DGT, spot sampling, port waters, dredging,*

The recommendations on the Quality of Littoral Waters in Port Areas included in R.O.M. 5.1-13 establishes the necessity for the evaluation of the port water quality by periodical spot water sampling with oceanographic bottles, this is, discrete water sampling. Recently, the use of passive samplers (PS) was proposed for the chemical status assessment in the context of the Water Framework Directive (WFD, 2000/60/CE). While spot sampling may provide contaminants concentration at the moment of the sampling, PS can provide the time average concentration of such contaminants, which represents the concentration for the entire exposure time.

Considering this, this research aims to use PS to assess the impacts of dredging activities in the quality of port waters in the Royal Maritime Club of Abra (Bilbao Port, N. Spain). For this purpose, Diffusive Gradient Thin Films (DGTs) PS were deployed for 5 days at five stations with increasing distance from the dredging area, in 3 different moments: before, during and after dredging activities. Spot water samples were simultaneously collected during DGT deployments and retrievals, at the five stations. Hydrographic parameters (temperature, oxygen, salinity, pH) were measured *in situ*, priority (Cd, Ni, Pb) and other specific metals (Cu, Co, Zn) were analysed at the laboratory by ICPMS. Dissolved organic carbon (DOC), turbidity and suspended solids (SS) were also analysed in the water samples.

Preliminary results shows that spot sampling metals analyses are mostly below detection limit while DGTs provided quantifiable concentrations for all metals. A significant difference in SS, turbidity, Cr and Pb were found between before, during and after dredging campaigns. Fe concentrations were significantly higher during dredging, when compared to the other moments. Zn concentrations were higher during and after dredging. There is a significative difference in Cd concentration after dredging, in comparison to the other moments. A significative difference in Ni concentration were found between during and after dredging campaigns. Except for Cu in DGTs, metals variances were significantly affected by dredging activities. DGTs provided a more meaningful information than discrete water sampling.

Evolución del estado de los bancos naturales de Chirla (*Chamelea gallina*) en el litoral mediterráneo de Andalucía.

Cristina Ciércoles Antonell[1*], Pablo Marina Ureña[1], Javier Urra Recuero[1], Jose Miguel Serna Quintero[1], Jorge Baro Domínguez[1]

[1*] Centro Oceanográfico de Málaga, Instituto Español de Oceanografía (CNIEO-CSIC). Puerto Pesquero s/n. 29640, Málaga, cristina.ciercoles@ieo.es

Palabras clave: *recursos pesqueros, sostenibilidad, pesca artesanal, capturas, biomasa.*

En este estudio se comparan y discuten los resultados obtenidos en las evaluaciones de los bancos naturales de chirla, *Chamelea gallina*, en dos zonas de producción (Calaburras-Torrequebrada y Benalmádena-Málaga) del litoral mediterráneo de Andalucía, a lo largo de cuatro campañas de evaluación consecutivas (2019 y 2021).

La chirla es un bivalvo comercial capturado por la flota de pesca artesanal con draga mecanizada. Esta pesquería está regulada desde el 2014 por un plan de gestión con el fin de mantener el nivel de biomasa capturada por debajo de los puntos de referencia biológicos fijados, garantizando así la sostenibilidad del recurso. Actualmente se establece un cupo de captura para la chirla no superior a 25 Tm/campaña de pesca. La talla de primera madurez es de 16 mm, la talla mínima de captura (TMRC) está fijada en 25 mm y se establece una veda entre los meses de mayo y junio. Como apoyo al plan de gestión se realizan campañas de evaluación anuales e independientes de la pesquería que permiten evaluar la abundancia y biomasa del recurso.

Los resultados de estas campañas reflejan una disminución de la biomasa y la abundancia de la chirla entre los años 2019 y 2021, así como una disminución de la talla media y cambios en las distribuciones de tallas de las poblaciones capturadas, en las que el pico de mayor frecuencia aparece por debajo de la TMRC. Estos resultados puede deberse a varios factores. Por un lado el exceso de extracción de ejemplares de mayor talla (y mayor potencial reproductor) que puede mermar la capacidad de reclutamiento de las poblaciones al disminuir la producción total de ovocitos. Por otro lado la sobrepesca ocurrida durante la campaña 2019-2020, cuando se establecieron nuevas medidas de gestión que modificaron el periodo considerado como campaña de pesca y donde se extrajo un total de 81 t, provocando un declive en las capturas del 2021. Y por último posibles condiciones ambientales desfavorables que afectarían negativamente al reclutamiento. Así pues, sobrepasar las cuotas de captura en poblaciones que ya se encuentran mermadas además del posible efecto de variaciones en las condiciones ambientales, pone en riesgo el futuro de la pesquería de esta especie.

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Evolução paleoambiental e ocupação mesolítica do estuário do Sado

Ana Maria Costa[1*], Maria da Conceição Freitas[2], Ana Cristina Araújo[3], Mariana Diniz[4], Pablo Arias[5]

[1*] Laboratório de Arqueociências (LARC)-DGPC; CIBIO; BIOPOLIS; IDL - Instituto Dom Luiz; IIIPC (Univ. Cantábria - Gobierno de Cantábria/Santander), Calçada do Mirante à Ajuda, nº 10ª, 1300-418 Lisboa, Portugal.
[2] IDL - Instituto Dom Luiz; Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal, acosta@dgpc.pt
[3] Laboratório de Arqueociências (LARC)-DGPC; CIBIO; BIOPOLIS; UNIARQ, Faculdade de Letras, Universidade de Lisboa, 1600-214-Lisboa, Portugal.
[4] UNIARQ, Calçada do Mirante à Ajuda, nº 10ª, 1300-418 Lisboa, Portugal.
[5] IIIPC (Univ. Cantábria-Gobierno de Cantábria/Santander), Avna de los Castros 52, 39005 Santander, Espanha.

***Palavras-chave**: Geoarqueologia, sedimentologia, multi-indicadores ambientais, paleoecologia.*

Foi realizado um estudo multidisciplinar e multi-*proxy* na área a montante da actual delimitação do Estuário médio do Sado, no Canal de Alcácer do Sal, com o objectivo de caracterizar as condições ambientais (estuarina / fluvial) da área durante a ocupação mesolítica (ca. 8400-7000 cal BP) e a sua evolução durante o Holocénico. Os resultados (textura, susceptibilidade magnética, química orgânica e palinologia) indicam que durante o Holocénico a influência marinha no canal se estendeu até ca. de 65 km (Laxique) a montante da foz actual do estuário, criando condições favoráveis para o desenvolvimento de ambientes intermareais. Entre ca. 8900 e 7000 cal BP, i.e., durante a ocupação mesolítica do vale do Sado, o canal apresenta condições subtidais salobras pelo menos até 57 km (São Bento) a montante da foz. Rasos de maré e sapais desenvolvem-se nas margens menos profundas, com condições para o desenvolvimento de bancos de moluscos, explorados pelos caçadores recolectores do Mesolítico. A inundação do canal está directamente relacionada com a subida do nível médio do mar e com a profundidade da incisão do vale.

Não foi ainda possível determinar a extensão máxima do estuário médio no Holocénico inicial e médio, mas há evidências de influência marinha (presença de diatomáceas marinhas e alta concentração de sulfatos) 65 km a montante da foz durante a transição do Holocénico médio/recente. A planície aluvial começa assim a formar-se há 4000 anos em Laxique e há 3300 anos estava 50 km a montante do foz do estuário (Arapouco), na área onde hoje se localiza limite de influência salina. A agradação e progradação da planície aluvial estão essencialmente relacionadas com a desaceleração da taxa de subida do nível médio do mar.

Alterações na localização da transição fluvio-estuarina foram identificados após 7000 cal BP, essencialmente relacionados com a ocorrência de períodos com maior ou menor precipitação.

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Sponges biodiversity in Capbreton Canyon

Javier Cristobo[1*], Cristina Boza[1], Alejandra Calvo-Díaz[1], Pilar Ríos[1]

[1*] Instituto Español de Oceanografía (IEO-CSIC), Centro Oceanográfico de Gijón, Av. Príncipe de Asturias 70 bis, 33212 Gijón, Asturias, Spain, javier.cristobo@ieo.csic.es

Key words: *Taxonomy, Porifera, Diversity, deep-sea, Bay of Biscay.*

The Capbreton Canyon is located in the south-east of the Bay of Biscay. It runs from east to west north of the Cantabrian Basque continental shelf. It is approximately 200 to 2000 m deep and more than 250 kilometres long. The Spanish Institute of Oceanography (IEO-CSIC) and the AZTI under the umbrella of the INTEMARES project organized two campaigns in 2019 and 2020. Their aim was carrying out the bathymetric survey with a multibeam echo sounder, the high-resolution seismic reconnaissance and the characterization of bottoms and habitats of the underwater canyon system and pockmark fields.

The present synthesis focuses on the sponges biodiversity recorded from those expeditions. These species were collected in 20 stations, between 98 and 855 m deep, with a rock dredge, a beam trawl and an accidental specimen in the lander sampler.

Sponges are invertebrates that are important in benthic ecosystems both in terms of biogeochemical cycles and of ecological interest. Their significance is due to their role as bio constructing and habitat-forming organisms that are used by other species. Sponge grounds are, therefore, areas of high biodiversity.

The set consists of 546 specimens collected preferably on rocks in the form of crusts or on soft bottoms. Of the four classes of this phylum, only samples of Demospongiae and Hexactinellida have been collected. The best represented order in the said samples is Axinellida, mainly due to the presence of the genus *Phakellia*. However,many other orders are significant too: Poecilosclerida, Tetractinellida, Haplosclerida, Suberitida, Dendroceratida and Polymastiida. Among the most abundant species *Phakellia ventilabrum*, *Hymedesmia paupertas*, *Chelonaplysilla noevus* and *Geodia barrette* can be highlighted. Since there are very little published data on this phylum in the study area, this communication shall provide an analysis of all the taxa represented, as well as a complete list of the identified species.

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Geological evolution of western Iberia during middle Campanian to Ypresian

Pedro P. Cunha[1]

[1] University of Coimbra, MARE - Marine and Environmental Sciences Centre, Department of Earth Sciences, Rua Sílvio Lima, Univ. Coimbra - Pólo II, Coimbra 3030-790, Portugal, pcunha@dct.uc.pt

Key words: *N-S compression, volcanism, diapirism.*

Since middle Campanian, Iberia experienced an increasing intraplate deformation as a result of stress transmission from its successive active borders, first the northern and later the southeastern. The change from the stage of rifting to the one of passive continental margin occurred by middle Aptian. By middle Campanian (ca. 80 Ma), the geodinamic context of "pure passive margin" was replaced by a N–S compressive tectonic regime, leading to the partial closing of the Bay of Biscay, but also uplift of the Pyrenees and Cantabrian Mountains. In the Western Iberian Margin, during the late Campanian to Ypresian tectono-stratigraphic stage, the weak N–S compression resulted in the reactivation of N–S, SW–NE and NW–SE subvertical faults (Variscan). The two later systems acted as strike-slip faults characterised, respectively, by a left-lateral and right-lateral transpressive component associated with vertical displacement. During the late Campanian, these fault systems induced intense diapirism (mainly along N-S faults) and intrusion of magmatic melts that promoted volcanism (basalts, mainly in the Lisboa area) and the generation of the Sintra (mainly granite) and Sines and Monchique (mainly syenite) magmatic massifs. The late Campanian to Ypresian tectono-stratigraphic stage is represented by two allostratigraphic units (UBS5 and UBS6). Typically, the UBS5 (upper Campanian to Maastrichtian) overlies the UBS4 (Aptian to lower Campanian) being the contact between them a disconformity, whilst adjacent to diapiric structures it is an angular unconformity. Onshore, the UBS5 has a thickness of <200 m and consists of yellow quartz sands and red to green silts with nodular calcareous paleosols, representing deposits of a coastal plain environment with meandering fluvial systems draining to NW. They change distally into lagoon–barrier islands and restricted shallow marine deposits. Diapiric structures usually along N–S faults uplifted areas where coalescent alluvial fans developed, consisting of red conglomerates with limestone clasts and some silts. Their offshore equivalents are shallow marine siliciclastic dolomites (90 m thick), consisting of grey-brown, dolomite-cemented quartzarenites grading to sandy crystalline dolostones with intercalations of grey to light brown marls and occasionally sandy limestones in the lower part. The UBS6 (Paleocene to Ypresian) is represented onshore by beds of red sands, brownish-red clayish silts, and some calcitic conglomerate pavements.

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Geological evolution of western Iberia during Lutetian to middle Tortonian

Pedro P. Cunha[1]

[1] University of Coimbra, MARE - Marine and Environmental Sciences Centre, Department of Earth Sciences, Rua Sílvio Lima, Univ. Coimbra - Pólo II, Coimbra 3030-790, Portugal, pcunha@dct.uc.pt

***Key words**: N-S to NNW-SSE compression, lithosphere folding, planation.*

In the Western Iberian Margin, during the Lutetian to lower Chattian tectono-stratigraphic stage, the N–S to NNW–SSE compression reached a maximum deformation within northern border of Iberia and a strong intraplate compression which led to broad lithospheric folding. In mainland Portugal, the WSW–ENE trending synclines generated elongated sedimentary basins (e.g. Mondego Cenozoic Basin, Lower Tejo Cenozoic Basin and Alvalade Cenozoic Basin), also affected by dominant SSW–NNE, SW–NE and W–E subvertical faults.

During the uppermost Chattian to lower Tortonian tectono-stratigraphic stage, a more intense NNW–SSE oriented compression generated active faulting, mainly as NNE–SSW left lateral strike-slip faults and W–E reverse faults, coeval with wide drainages routed towards the Atlantic coast and the development of a vast regional planation surface on the Iberian Massif (in the NE).

Several alostratigraphic units were identified.

- The UBS7 and UBS8 (Lutetian to lower Chattian) correspond to sedimentary deposits of low gradient alluvial fans and large ephemeral braided rivers. The main lithologies are poorly-sorted green arkoses and conglomerates. Esmectite is the dominant clay mineral, with accessory paligorskite, chlorite and illite.

– The UBS9 and UBS10 (upper Chattian to lower Tortonian) comprise orange coloured fluvial arkoses and green clays. The fluvial systems drained to the Atlantic Ocean. The sandy-clay deposits are rich in feldspars (arkoses), with pavements of clasts and some interbedded lutites. Some layers with oysters indicate the penetration of brackish water to about 100 km from the current equivalent environmental position during eustatic high levels. Some fossil mammal occurrences enable to establish correlation with the distal region of the basins, onshore, especially with deposits in the Lisboa area, particularly for the Middle Miocene and early Tortonian. The clay mineral associations are dominated by smectite, with accessory kaolinite and illite or kaolinite with accessory illite.

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Geological evolution of western Iberia since middle Tortonian

Pedro P. Cunha[1]

[1] University of Coimbra, MARE - Marine and Environmental Sciences Centre, Department of Earth Sciences, Rua Sílvio Lima, Univ. Coimbra - Pólo II, Coimbra 3030-790, Portugal, pcunha@dct.uc.pt

***Key words**: NW-SE compression, alluvial fans, endorheic to exorheic drainage.*

In the Iberian Peninsula, the Betic compression is related to a NNE–SSW relative plate convergence between Africa and Europe since the late Chattian, which changed to a NW–SE orientation during the Tortonian (by ca. 9.7 Ma). This caused the renewed uplift of the Central System (Spanish and Portuguese) and the Western Mesozoic Terrains (both onshore) and the Estremadura Spur (offshore) and the Plateaus and Mountains of Northern Portugal, mainly by reverse faults and thrusts.

The upper Tortonian to Present tectono-stratigraphic stage is characterized by a climax of intraplate compression, dominantly with the orientation of the horizontal maximum compressive stress as NW–SE. The new tectonic setting caused the renewed left lateral movement and strong vertical displacement of NNE–SSW strike slip faults (key examples include the Verín–Penacova and Vilariça–Manteigas faults), the generation of NE–SW thrusts (e.g. the Lousã, Sobreira Formosa and Ponsul–Gata faults), leading to renewed uplift of the Portuguese Central Range, as well as the compressive reactivation of Mesozoic normal faults (e.g. the Arrife Fault) (inversion of the Mesozoic tectonics). During the last 3.7 Ma, the compressive active stresses and reverse focal mechanisms and the sedimentary record point to a NW-SE to WNW–ESE oriented compression.

Several unconformity-bounded sequences were recognised in the middle Tortonian to present tectono-stratigraphic stage:

– UBS11 (upper Tortonian to lower Messinian) relates to poorly-sorted green alluvial fan gravels (clasts of metagreywacke and phylite) and silty-clays. The clay mineral association is dominated by smectite, with accessory illite.

– UBS12 (uppermost Messinian to Zanclean) comprises poorly-sorted red alluvial fan gravels and silts with a clast composition dominated by white quartz and metagreywacke. The clay mineral association is composed of illite and kaolinite, in similar proportions, whilst goethite is always present.

– UBS13 (uppermost Zanclean to Gelasian) is characterized by heterometric ochre coloured alluvial fan gravels, containing large quartzitic boulders in areas sourced from Ordovician ridges. These are linked laterally to large gravelly and sandy rivers and marine siliciclastics, even recorded onshore. The clay mineral association is dominated by kaolinite, with accessory illite.

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Montes cántabros: nuevos datos y evidencias de deformación compresiva reciente

Miguel Ángel de la Fuente Oliver[1*], José Luis Granja-Bruña[1], Alfonso Muñoz Martín[1], María Druet Vélez[2], Adolfo Maestro González[2], Jorge Gallastegui Suárez[3]

[1*] Grupo de Tectonofísica Aplicada, Fac. CC Geológicas, Univ. Complutense, C/ José Antonio Nováis 2, 28040 Madrid, España, miguelde@ucm.es

[2] Instituto Geológico y Minero de España.

[3] Universidad de Oviedo.

Palabras clave: *Golfo de Vizcaya, Margen Cantábrico, Montes Cántabros, Inversión tectónica, Sísmica de reflexión multicanal.*

La formación del Golfo de Vizcaya comienza con una etapa de rift durante el Jurásico Inferior la cual progresa, y llega a formarse corteza oceánica e hiperextensión en el margen. Posteriormente, entre el Paleoceno – Eoceno se cierra parcialmente debido a la compresión tectónica alpina.

El Golfo de Vizcaya se encuentra limitado al norte por la amplia plataforma continental francesa y al sur por la española, mucho más estrecha. La llanura abisal está a una profundidad que oscila entre 4500 y 4900 metros y un relleno sedimentario fundamentalmente turbidítico. A 140 km al norte de Cabo Ortegal, se encuentran los Montes Cántabros, que se elevan 450 metros sobre el fondo marino de la llanura abisal y forman un relieve sinuoso y alargado en dirección ENE – OSO.

En Octubre de 2021 durante la campaña de geofísica marina ‘’MARIBNO’’ se adquirieron una serie perfiles de sísmica multicanal en las inmediaciones de los Montes Cántabros, mejorando la calidad y resolución de los tomados por campañas anteriores como la Discovery-11 y Charcot de 1966. Uno de los perfiles adquiridos se ha realizado por encima del sondeo 119 del ‘’*Deep Sea Drilling Project’’*. Los nuevos perfiles de sísmica de reflexión multicanal proporcionan una alta relación señal – ruido y una gran penetración en la corteza, siendo posible observar reflexiones coherentes hasta más de 10 segundos (TWT). Estos perfiles proporcionan nuevos datos sobre la inversión tectónica en el margen ibérico noroeste y evidencias de deformación compresiva reciente.

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The Trans-Iberia Central Orogen and aborted subduction

Gerardo de Vicente[1, 2*], Pedro Terrinha[3], Ramón Carbonell[4], Alfonso Muñoz-Martín[1,2], Antonio Olaiz[1,5]

[1] GEODESPAL, F.C. Geológicas Universidad Complutense de Madrid, gdv@geo.ucm.es

[2] Instituto de Geociencias, IGEO, CSIC-UCM.

[3] Instituto Português do Mar e da Atmosfera (IPMA), Instituto Dom Luiz (IDL).

[4] Geosciences Barcelona GEO3BCN-CSIC, Barcelona.

[5] Repsol Exploración S.A.

Key words: *Plate limit, Cenozoic, Alpine deformation.*

The Iberian microplate was extensively deformed and shortened during the Cenozoic through widespread buckling and the development of a number of thrusts and strike-slip faults. Two main orogens are recognized: Pyrenees-Cantabrian Pyrenees, to the N, and Betics, to the S, both with their prolongations in the Atlantic offshore (Galicia Bank and Gorringe?). In addition, there is a E-W trending central deformation belt that has, traditionally, been considered as intraplate deformation. It is formed by the Iberian Chain (IC), the Spanish-Portuguese Central System (SPCS) and, offshore, the Estremadura Spur (ES) and the Tore Seamount (TSM). The aforementioned sectors share similar structural characteristics: thick-skinned tectonics with E-W to NE-SW trending thrusts with trace-lengths up to 300 km. The deformation belt is nucleated and inverts previous rifts, but also affects extended and hyper-extended continental crust, non-extended Variscan basement crust, as well as transitional crust and oceanic crust. Given the length of the deformed zone (more than 1,500 km), its position and age of deformation (Late Cretaceous to Pliocene, ~85My), we suggest that it is an intra-plate trans-continent-oceanic, double-vergent, lithospheric orogen connected to an aborted subduction zone. The arguments, that cause us to believe this idea, are: (i) The S thrust of the SPCS, N of the Cenozoic Madrid Basin offsets the Moho, ranging between 3 and 5 km throw, implying some continental subduction. (ii) The SPCS has areas with intracrustal delamination. (iii) Transpressional structures in the CI, necessarily go through the entire crust. (iv) Compressional structures perpendicularly cross the ocean-continent transition zone (v) Between the ES and the TSM, there are significantly earthquakes concentrations, with 28 and 40 km hypocentral depths, (at mantle depth) and earthquakes up to 100 km depth. Deformation would have occurred earlier in the E, and migrated to the W, where the Portuguese sector of the SPCS, the ES and the SST are still considered as active structures. The aborting process would also have migrated, in age, from E to W, induced by the Late Miocene back-arc extensions associated with the Calabrian arc and the emplacement of the Alboran Domain.

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Morphosedimentary dynamics based on channels hierarchy in the Capbreton canyon system

Irene Díez-García[1*], Beatriz Arrese[1], María Gómez-Ballesteros[1], Ibon Galparsoro[2]

[1*] Spanish Institute of Oceanography, C/Corazón de María 8, 28002 Madrid, ip.diez@ucm.es

[2*] AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Herrera Kaia, Portualdea z/g, 20110, Pasaia, Spain.

Key words: *Submarine canyon, hierarchy, morphosedimentary, geomorphology.*

The Capbreton submarine canyon is located in the eastern sector of the Bay of Biscay. It runs along 300 km parallel to the continental Cantabrian margin and is the main canyon of a complex system of submarine canyons. Topographic characteristics of the canyons influence hydrodynamic processes and convert them preferred conductive channels for sediment transport along the different topobathymetric levels from the shallowest areas of the margin to deep areas. Based on several geomorphological analyses previously carried out in this canyon system, the present contribution delves into prevailing submarine canyon, its tributaries channels and their interfluvial platforms dynamism. The results of this study contribute to the knowledge about sedimentary transport and erosion processes. Bathymetric information was obtained during two scientific surveys in 2019 and 2020 using a EM710 multibeam echosounder. After data processing, a 10 m horizontal resolution Digital Elevation Model (DEM) was produced. Afterwards, a novel method was developed and implemented based on the application of hydrological indices (HI) with GIS tools to the DEM. By implementing a specific GIS workflow developed based on flow direction and flow accumulation maps, a channels hierarchy classification was established for the whole canyon system including the main canyon and its tributaries. Five different HI were selected according to different geomorphological properties influenced by the action of different current flows in the channels. The obtained results are indicative to the preferential flow through Capbreton submarine canyon system as stream power, erosion, or sedimentation capacity, among others. Remarkable differences can be observed between the north and south flank of main submarine canyon due to the action of the current flow. The influence of the interfluvial platforms on the sediment transport close to the main channel are also observed. Capbreton canyon system plays an important role in the regional marine dynamics, connecting the continental shelf and the abyssal plain across the slope in the transport of sediment, biogenic and terrigenous material, and particles of different origin, including those produced by anthropic action. Thus, the results obtained highlight the great importance of Capbreton canyon system as host of high biodiversity.

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Comparison of the spatial distribution of longline fisheries from VMS and AIS information

V. Duque-Nogal[1*], M. Huerta[1], D. Cano[1], J. Rodríguez[1], M. Sáinz[1], P. Verisimo[1], U. Fernández-Arcaya[1], A. Rodríguez-Basalo[1], E. Ceballos[1], M. Ruíz[1], A. Punzón[1]

[1] Centro Nacional Instituto Español de Oceanografía, CO Santander, 39004 Santander, Cantabria, veronica.duque@ieo.es

Key words: *IMPALHA Project, The Avilés Canyon System, benthic habitats, spatial information, vulnerability.*

The main goal of IMPALHA Project is to do a diagnosis of the impact of long line fishing gears (hook fishing gears) on the seafloor (benthic habitats). In the Cantabrian Sea, specifically in The Avilés Canyon System, there is an important long line fishing activity. Depending on the fishing tactic, target species, kind of long line gear, etc., the benthic species impacted are different. Therefore, the vulnerability (impact sensitivity and level of exposure) of seabed habitats is also different. The type of long line gears, and target species, used in this area are “piedra-bola”, target species are european hake and pollack, and “palangrón” european conger and greater forkbeard are the target species of this gear.

Until now, spatial information available to do this kind of analysis belonged to the industrial fleet (more than 15 m length vessels), information of the Vessel Monitoring System (VMS). It was assumed that the spatial distribution of the artisanal fleet (length lower than 15 m) was similar than the distribution of industrial fleet. To do a more real diagnosis of the affected seabed habitats, it is needed to analyse and check if the spatial distribution of both fleets (industrial and artisanal) are similar. Actually, there is not a Vessel Monitoring System for the artisanal fleet but is available the Automatic Identification System (AIS), that provide information such us position, course and speed.

In this study, the spatial distribution of the different long line fleet is analysed, and also the interaction of this activity with the benthic habitats, in The Avilés Canyon System. Moreover, the spatial distribution of industrial and artisanal long line fleet, fishing in the area, are compared. The goal of this comparison is to see if they share some fishing grounds and identify the specific benthic habitat that is impacted, depending on the fleet and its fishing tactic.

Acknowledgements. El proyecto IMPALHA (@IMPALHA_Sci) se realiza en colaboración con la Fundación Biodiversidad del Ministerio para la Transición Ecológica y el Reto Demográfico, a través de su Programa Pleamar, cofinanciado por el FEMP.

Influencia del aumento del nivel del mar en las marismas del estuario del Oka, País Vasco

Beñat Egidazu[1*], Manu Monge-Ganuzas[2], María Aranda[3], Gloria Peralta[4]

[1*] Basque Climate Change Center, Edificio Sede 1, 1º Planta 1, 48940 Leioa, España, benat.egidazu@bc3research.org

[2] Oficina Técnica de la Reserva de la Biosfera de Urdaibai, Dirección de Biodiversidad y Participación Ambiental del Gobierno Vasco, 48300 Gernika-Lumo, Carretera Gernika-Lumo s/n, P.K. 130, España.

[3] Departamento de Ciencias de la Tierra, Universidad de Cádiz, 11510 Puerto Real, España.

[4] Departamento de Biología, Universidad de Cádiz, 11510 Puerto Real, España.

Palabras clave: *cambio climático, vegetación halófita, sedimentación*

Las retroalimentaciones entre la concentración de sedimentos, la absorción de sedimentos por las plantas, la acumulación de materia orgánica bajo el suelo, la productividad de las especies vegetales halófilas y la exposición a las inundaciones determinan el funcionamiento y la evolución de las marismas costeras. Esto, junto con la situación actual de aumento del nivel del mar y la ocupación de las zonas costeras, amenazan el destino de estos valiosos ecosistemas. El presente estudio pretende evaluar el destino potencial de las marismas del estuario del Oka (País Vasco) bajo diferentes escenarios de subida del nivel del mar y diferentes proyecciones temporales, y poner los resultados a disposición del público en general. Para ello, este trabajo desarrolla un modelo predictivo geoespacial que tiene en cuenta las interacciones eco-geomórficas de las variables mencionadas anteriormente. Los resultados sugieren que la zona de estudio presentará un aumento de la superficie de la marisma en los escenarios de cambio climático RCP 4.5 y RCP 8.5 junto con un aumento de la exposición a las inundaciones del sistema. Los resultados también sugieren que esta evolución de la marisma se apoya principalmente en la capacidad de *Halimione portulacoides* para modificar las tasas de deposición, facilitando las condiciones ecológicas para el desarrollo de *Juncus maritimus*. Las incertidumbres de este modelo son altas debido a la baja calidad de la información disponible. Sin embargo, el aumento de la calidad de la información que alimenta el modelo y el conocimiento de las interacciones interespecíficas de las especies de las marismas podría mejorar estas incertidumbres.

Structure and geomorphology of the southeastern Iberian: The case of the Gulf of Vera

Gemma Ercilla[1*], Jesús Galindo-Zaldívar[2,3], FAUCES cruise team

[1*] Instituto de Ciencias del Mar, CSIC, Continental Margins Group, 08003 Barcelona, Spain, gemma@icm.csic.es
[2] Dpto. de Geodinámica, Universidad de Granada, 18071 Granada, Spain.
[3] Instituto Andaluz de Ciencias de la Tierra, CSIC-UGR, 18100 Granada, Spain.

Key words: *Tectonic indentation, contourites, mass-movement deposits, compressive structures, geomorphic processes.*

A multidisciplinary study of the Palomares continental margin and adjacent Algerian abyssal plain (i.e., Gulf of Vera, Southeastern Iberian) that includes geomorphology, stratigraphy, geophysics, tectonics, sedimentology and physics oceanography, reveals a complex margin physiography imprinted by an irregular basement structure made up of elongated metamorphic antiforms pierced by igneous bodies, and synforms, and an abyssal seafloor dotted by numerous subrounded and elongated crests due to diapir piercing. The antiforms and synforms accommodate the deformation of the Aguilas Arc continental tectonic indentation that develops in the framework of the Eurasian–Africa plate collision. The sedimentary structure of the Upper Miocene and Plio-Quaternary deposits indicates that although bottom current action is responsible for the primary sedimentation that mostly shapes and builds the Palomares margin, 97% of this region's seafloor is affected by mass-movement processes that erode, deform, fault, and slide contourite sediments. Mass-movements have favoured the enlargement of long and short submarine canyons formed during the Messinian Salinity Crisis, and gully incisions developed mainly during the Plio-Quaternary. Mass-movements have also resulted in the formation of recurrent mass-flow deposits that shape seafloor with evacuation erosive features evolving downslope to accumulative depositional features. Likewise, they have been responsible of three basin-scale gravitational slides (named Polopo, Aguilas and Gata) spreading above the Messinian Salinity Crisis salt layer. These large gravitational slides comprise an upslope domain with extensional features affecting the continental margin, and a downslope domain with contractional features such as diapirs dotting with numerous crests the seafloor of the abyssal plain. The occurrence of mass movements was mostly governed by the indentation that provokes a progressively southeastward tectonic tilting and related oversteepening of the continental margin, thus reducing the stability of the contourites. Likewise, tectonic tilting and subsidence of the abyssal plain would have favoured the flow of the underlying Messinian Salinity Crisis salt layer, contributing to the basin-scale gravitational slides.

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Impact of the bottom long-line fishing on the *Asconema setubalense* community at the "Banco de la Concepción" seamount (The Canary Islands) under low fishing intensity conditions

Jesús M. Falcón[1*], Laura Martín-García[1], Marcos González-Porto[1], Antonio Punzón[2], Pablo Martín-Sosa[1]

[1*] Centro Oceanográfico de Canarias, Instituto Español de Oceanografía-CSIC, Calle Farola del Mar, nº 22, 38180, Dársena Pesquera, S/C Tenerife, Canarias, Spain, jesus.falcon@ieo.csic.es

[2] Centro Oceanográfico de Santander, Instituto Español de Oceanografía-CSIC, Promontorio San Martín s/n, 39004 Santander, Cantabria, Spain.

Key words: *fishing footprint, vulnerable marine ecosystem, SCI.*

The "Banco de La Concepción" seamount (BC) forms part of the Nature 2000 network as Site of Community Importance (SCI). The SCI declaration was based, among other elements of interest, on the presence of the habitat "1170-Reefs", being the bathyal rock with the large Hexactinellida sponge *Asconema setubalense* one of the largest and most abundant communities in these rocky bottoms. Populations of *A. setubalense* have a three-dimensional structure and increase the complexity and biodiversity in their habitat. Therefore, *A. setubalense* is considered a habitat forming species. On the other hand, at BC the most intense fishing activity is carried out not linked to the bottom, to catch tuna, swordfish and small pelagics, but there are also a few vessels that use bottom longlines on rocky areas of the top and the slope of the seamount, largely coinciding with the distribution areas of *A. setubalense*. Bottom longlines, like other fishing gears, can produce an impact when they are lost in the environment and also damage benthic habitats entangling and breaking off branched and/or large organisms, as the case of *A. setubalense*. This large sponge (up to 1 m tall) is a low-growing organism, so its aggregations, as for other deep-sea sponges, are considered Vulnerable Marine Ecosystems.

The objective of the present study is to evaluate the possible impact of the use of the bottom longline on the community of *A. setubalense* at the BC, based on the information obtained from the INTEMARES-A4 CANARIAS 1118 research survey, using non-invasive methods, within the framework of the LIFE IP INTEMARES Project. Impacts on the structure of the community and the density of *A. setubalense* and other associated habitat forming species are evaluated through different statistical uni- and multivariate approaches. This is the first study assessing the impact of bottom longlines on the bathyal benthic environment of The Canary Islands.

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Unravelling the November 1st, 1755 tsunami record across the Atlantic

Francisco Fatela[1*], Pedro Costa[2], Francisco Dourado[3]

[1*] Instituto Dom Luiz (IDL) and Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal, ffatela@fc.ul.pt

[2] Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal. Departamento de Ciências da Terra, Faculdade de Ciências e Tecnologia, Universidade de Coimbra, Portugal.

[3] CEPEDES, Universidade do Estado do Rio de Janeiro, Brasil.

Key words: *Foraminifera, earthquake, high energy events*

Foraminifera can provide fundamental contributions to the characterization of tsunami deposits. Among others, several multiproxy studies published on the sedimentological record of the tsunami generated in the morning of November 1st,1755, by the "Lisbon" earthquake have focused on Iberia. Severe destruction mainly affected the SW Atlantic margin, but historical sources testifies that the event traveled west along the Atlantic, although with milder consequences. The inundation by tsunami waves in the afternoon of that day is reported in NE Brazil, but none sedimentological evidence is known in the South America until today. However, the finding of a peculiar coarse, apparently marine-sourced sand layer within an aeolian sequence in Pontinhas (Pernambuco, Brazil) represent an encouraging point. First, the significant presence of *Ammonia* spp., *Cibicides* spp., *Elphidium* spp., *Quinqueloculina* spp., *Pyrgo* spp., among others, as well as juveniles of planktonic foraminifera, confirm the marine origin of the deposit. Besides, four assemblages may be highlighted, 1) lagoon/estuarine: *Ammonia tepida*, *A. parkinsoniana*, *Elphidium excavatum*, *E. oceanense*; 2) coastal-marine: *A. beccarii*, *Quinqueloculina seminula*, *Q. distorqueata*, *Elphidium sagra*, *Lobatula lobatula*, *Rotorbis auberi*; 3) inner-shelf: *Pyrgo subsphaerica, Q. auberiana*, *Q. zhengi*, and juveniles of *Bolivina* spp., *Uvigerina* spp.; 4) reef-zone: *Amphistegina gibbosa*, *Peneroplis pertusus* and *Amphisorus hemprichii*. The lagoon/estuarine assemblage exhibits its maxima (23%) at the base of the deposit where coastal-marine and inner-shelf assemblages together record their minimum (76%). A conspicuous change is found above, where the ensemble of these marine assemblages reach 81%, followed by a surge of reef-zone foraminifera (21%) and broken tests (29%), and a drop of lagoon/estuarine species to 5%. At the top, this assemblage recovers to 17%, marine assemblages reduces to 76% and the broken tests to 14%. These data suggest the inundation of an open estuary by a high energy event that transported reef-zone and other marine foraminifera inland with increased broken tests. The acceptable coherence of OSL sediment dating, suggests that Pontinhas deposit is likely to represent a sedimentological record 1st November, 1755 tsunami on the western Atlantic coast.

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Vulnerability of complex Roman production networks on the Atlantic coasts of southern Iberia – the example of Boca do Rio

Lisa Feist[1*], Piero Bellanova[1], Hannes Laermanns[2], Sebastian Frank[2], Florian Hermann[3], Margret Mathes-Schmidt[1], Dominik Brill[2], João Pedro Bernardes[4], Felix Teichner[3], Helmut Brückner[2], Klaus Reicherter[1]

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Aachen, Germany, l.feist@nug.rwth-aachen.de
[2] Institute of Geography, University of Cologne, Cologne, Germany.
[3] Institute of Pre- and Early History, Philipps-Universität Marburg, Marburg, Germany.
[4] Faculty of Human and Social Sciences, Campus de Gambelas, University of Algarve, Faro, Portugal.

Key words: *1755 CE Lisbon tsunami, high-energy event, multi-proxy approach, geoarchaeology, Roman marine industry.*

The infamous 1755 CE Lisbon tsunami flooded large coastal areas and also left its sedimentary imprints in the Boca do Rio valley (western Algarve, Portugal). Here, the tsunami layer is very well preserved and has been extensively studied by various research teams. Deposits of preceding extreme wave events, however, have rarely been described.

In the case of Boca do Rio, Roman ruins of a fish salting complex are situated at the modern coastline. During Early Imperial Times, preserved fish and *garum*, a special kind of fish sauce, was transported from the Algarve throughout the Roman Empire. The production complex at Boca do Rio underwent a significant and sudden decline and reorganisation between the 2nd and 3rd centuries CE. Considering the relative vulnerability of the region to extreme wave events, the hypothesis of a sudden destruction of the production sites by a tsunami or storm event was investigated by a joint research project of the RWTH Aachen, Cologne and Marburg universities over the past years.

Geoscientific and archaeological approaches were combined to conduct a) a high-resolution multi-proxy geoscientific study with the aim of detecting the sedimentological footprints of other extreme wave events (besides 1755 CE), including Roman times; b) a reconstruction of late Holocene palaeoenvironments of the Boca do Rio floodplain; and c) an extensive archaeological study including several excavations of the Roman industrial settlement.

As expected, the 1755 CE tsunami was easily identified. Two additional extreme wave event layers of marine origin were detected either within floodplain deposits (mid or late 1st millennium CE) or the remains of the *garum* production site (14th century CE). But they do not correlate with the Roman period of major changes in the building stock of this remote industrial complex. There is no evidence at Boca do Rio that a marine event is the trigger for the changes in the settlement and the local economy. Rather, medium-term environmental changes could have been the driving force behind them.

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High-resolution X-ray CT-scans as an innovative tool to characterise offshore tsunami deposits

Lisa Feist[1*], Pedro J.M. Costa[2, 3], Simon Falvard[4], Raphaël Paris[4], Juan I. Santisteban[5], Piero Bellanova[1], Klaus Reicherter[1], the M152 scientific team

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Aachen, Germany, l.feist@nug.rwth-aachen.de
[2] Earth Sciences Department, Faculty of Sciences and Technologies, University of Coimbra, Portugal.
[3] Instituto Dom Luiz, Faculdade de Ciências, University of Lisbon, Portugal.
[4] Université Clermont-Auvergne, CNRS, IRD, OPGC, Laboratoire Magmas et Volcans, Clermont-Ferrand, France.
[5] Department of Geodynamics, Stratigraphy and Paleontology, Fac. Geological Sciences, Complutense University of Madrid, Spain.

Key words: *CT-scan, offshore tsunami deposits, backwash, internal structure, micromorphology.*

X-ray computed tomography (X-ray CT) has been a vital non-destructive tool for geoscience since the 1980s. But only since recently, with new technological advancements, X-ray CT-scan with resolutions at the micro (<100 µm) and nano-scale (<1 µm) are possible. These high-resolution X-ray CT-scans enable us to analyse sediment samples in terms of their internal structure and bedforms, fine-grained fraction, vertical trends of grain size, sedimentary fabric, distribution of heavy minerals, distribution of marine bioclasts and much more. Specifically for tsunami research, X-ray CT-scan fills a gap among other recent methods to understand the 3D micromorphology of these complex deposits and the relationship with flow dynamics of both the inundation and backwash phases.

We conducted high-resolution X-ray CT-scans of offshore tsunami deposits and the surrounding background sediments collected during RV METEOR cruise M152. Cruise M152 recorded hydroacoustic profiles and obtained a total of 23 sediment cores from the southwestern Algarve shelf in water depths between 65-476 m. Samples from two cores were selected for the X-ray CT-scans. The samples include a) the 1755 CE Lisbon tsunami deposit and b) an older, until now unknown, tsunami deposit with an age of ca. 3400 cal. yrs. BP. The 50 µm and 14 µm per voxel resolution scans of the 1755 CE tsunami deposit reveal shell fragments and sand-sized grains in a matrix of fine background sediments. The older deposit is much more complex with four distinctive sub-units identified and described by a multi-proxy approach. With the high-resolution scans several additional characteristic features of these sub-units were identified: I) the orientation of shell fragments in a shell hash layer; II) the internal structure of inversely graded fine sand; III) different grain sizes and small articulated bivalves in a thick medium sand layer; and IV) sand-sized grains, shell and wood fragments in a finer matrix of background sediment, similar to the 1755 CE tsunami deposit.

High-resolution CT-scan proves to be a helpful tool for a detailed characterisation of offshore tsunami deposits. Specific micro-scale features are revealed and can help to infer transport dynamics and depositional conditions.

The influence of Geological Setting on the erosion of Open and Pocket beaches: two study cases on the NW Iberian Atlantic Coast

Ángela Fontán-Bouzas[1, 2*], Tiago Abreu[3], Caroline Ferreira[1], Laura López-Olmedilla[2], Paulo A. Silva[2], Ana Bernabeu[1], Javier Alcántara-Carrió[4]

[1*] Centro de Investigación Mariña, Universidade de Vigo, GEOMA, 36310 Vigo, España, afontan@uvigo.es
[2] CESAM & Department of Physics, University of Aveiro, Campus de Santiago, 3810-193, Aveiro, Portugal.
[3] CESAM & Department of Civil Engineering, Polytechnic of Porto, 4249-015, Porto, Portugal.
[4] Dept. Geology and Geochemistry, Universidad Autónoma de Madrid, C/ Tomás y Valiente 7, 29049 Madrid, Spain.

***Key words**: Coastal monitoring, wave climate, storms, high-energy, morphological change.*

This study investigates the wave-induced response of morphologically contrasted beaches according to a comparable exposure degree to offshore wave forcing. Two datasets of simultaneous topographic surveys were conducted during winter 2018/2019. The study sites are located on the northwest Iberian sandy coastal stretches. A linear sandy beach on the Portuguese side contrasts with an embayed beach on the Spanish side. Both study sites, respectively, Mira Beach (Portugal) and Patos Beach (Spain), were chosen as part of a regional monitoring program (https://coastalenclave.webs.uvigo.es/). Morphological change indicators such as shoreline/berm retreat and vertical erosion, representing the horizontal and vertical shifts during winters, are of particular interest. In addition, analysis of offshore wave time series and in situ measurements allowed us to obtain both short-term (monthly) and long-term (yearly) hydrodynamic characteristics over the past decade. The results notably highlight the strong seasonality in the wave conditions for both locations. Accordingly, the most energetic winters are 2012/2013, 2013/2014, 2015/2016 and the last three winters (2017/2018, 2018/2019 and 2019/2020). The highest energy values occurred in 2013/2014 winter, a well-documented stormy period. The winter of 2018/2019, where the field surveys were carried out, reflects a typical energetic winter at both locations. The evolution of beach subaerial profiles highlights the significant variability between both beaches. In Patos Beach, the November and December storm sequences caused a reduction of up to 30% of volume. In contrast, a storm occurred in Mira Beach in February 2019, which caused the most significant losses in volume (up to 50% of its initial volume). Overall, beach erosion was dominant during winter, but field observations showed site-specific variations, e.g. in berm erosion trends and the shoreline migration. This research elucidates some of the potential impacts of different geological frameworks and highlights the importance of local monitoring programs that link hydrodynamic data with morphological evolution.

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Análisis y representación espacial de la variable *tiempo sumergido bajo el nivel del mar* durante la última fase glacial en las costas de la Península Ibérica

Pablo Fraile Jurado[1], María Esperanza Roldán Muñoz[1*], Juan Carlos Mejías García[1], César Borja Barrera[1]

[1*] Departamento de Geografía Física y Análisis Geográfico Regional, Universidad de Sevilla, C/ María de Padilla s/n, 41004-Sevilla, mrmunoz@us.es

Palabras clave: *Cartografía, línea de costa, cambios del nivel medio del mar, Último Máximo Glacial.*

Uno de los efectos más significativos de las oscilaciones climáticas acaecidas durante el periodo Cuaternario son los cambios del nivel del mar. Es frecuente encontrar en la literatura científica referencias sobre la evolución del nivel del mar durante el último periodo glacial, que lo sitúan en cotas batimétricas por debajo de los 120-130 m respecto de la posición actual durante el Último Máximo Glacial en torno a 20 ka BP. Es igualmente común indicar, localmente, las implicaciones que para una línea de costa supone un descenso de esta magnitud. Sin embargo, esta afirmación esconde una realidad considerablemente más compleja. El propósito de este trabajo es trascender esta aparente simplificación basada en la delimitación de líneas de costa que se corresponden con un evento de frío extremo y de relativamente corta duración, y proponer diferentes escenarios basados en cartografías que muestren el tiempo que permanecieron emergidas las diferentes áreas de la plataforma marina actualmente sumergidas de la Península Ibérica. Para ello sobre la curva de Silva *et al.* (2017), que supone una síntesis y una simplificación de la mayoría de las curvas publicadas hasta la fecha, se identificaron 12 episodios de subida o bajada del nivel del mar durante el periodo 120.000–6000 años BP. De esta manera, se ha desarrollado un algoritmo que relaciona la profundidad de cada celdilla de un modelo digital batimétrico actual con la posición y la tendencia de los cambios del nivel medio del mar identificados para cada subperiodo, obteniéndose para cada uno de ellos un ráster en el que se representa el tiempo emergido. El sumatorio de todos los ráster obtenidos permite conocer el tiempo emergido de cada punto situado en las aguas someras ibéricas, considerando las limitaciones del método (posibles cambios morfológicos, imprecisión de la curva de cambios del nivel del mar…). Los resultados muestran que, si bien amplios espacios de las mayores plataformas continentales más extensas (Golfo de Cádiz, Golfo de Valencia) estuvieron emergidos durante lapsos de tiempo superiores a los 60.000 años durante el último periodo glacial, aquellas áreas que permanecieron en una posición subaérea durante más de 100.000 años resultan poco significativas.

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Generación de nuevas variables polínicas antrópicas como herramienta para cuantificar la perturbación de los ecosistemas litorales en el Antropoceno

Carlos A. Galaz-Samaniego[1*], M. Cristina Peñalba[1], Alejando Cearreta[2]

[1*] Posgrado en Biociencias, Departamento de Investigaciones Científicas y Tecnológicas, Universidad de Sonora, Hermosillo, Sonora, México, galazs.carlos@gmail.com
[2] Departamento de Geología, Universidad del País Vasco UPV/EHU, 48940 Leioa, España.

Palabras clave: *Polen fósil, Impacto humano, Agrupamiento Jerárquico para Componentes Principales, Polen superficial moderno.*

Las actividades humanas relacionadas con el asentamiento, la producción y explotación de recursos naturales, el crecimiento económico y el desarrollo industrial han generado una presión ecológica de gran magnitud sobre los sistemas naturales terrestres y marinos que puede ser identificada en el registro sedimentario costero a través de diversas fuentes de información (proxies). El análisis polínico de alta resolución es uno de los principales métodos que permite describir las modificaciones de las poblaciones vegetales ante diversas presiones, tanto naturales como antropogénicas. Al ser organismos sésiles, las plantas son ampliamente sensibles a dichas perturbaciones y se convierten en un fuerte indicador de las condiciones de los ecosistemas. Sin embargo, la diferencia observada en los patrones de dispersión polínica, la cantidad de polen producido por las plantas, la sub- y sobrerrepresentación de algunos taxones, la preservación de los granos de polen en el sedimento y el bajo nivel taxonómico al que pueden identificarse, generan que la interpretación de los resultados obtenidos del análisis polínico pueda ser insuficientemente precisa. Ante la necesidad de comprender mejor, para la Costa Cantábrica, estos patrones reconocidos en el análisis de polen, se plantea un nuevo método estadístico que permite categorizar los diversos tipos polínicos en grupos indicadores de distintas actividades humanas, mediante la evaluación de la distancia espacial correlacionada con las frecuencias polínicas de diversos taxones en muestras de polen superficial moderno. Los grupos fueron generados a través del método de Agrupamiento Jerárquico para Componentes Principales (HCPC, por sus siglas en inglés) sobre los datos polínicos, y la distancia espacial planar, obtenida a través de software de SIG, aplicada a la localización de muestras de polen superficial moderno en relación con la cobertura y uso del territorio, obtenido del Instituto Geográfico Nacional de España. Las nuevas variables polínicas antrópicas definidas con esta metodología permitieron detectar perturbaciones en el ecosistema, definir cambios en el uso de suelo y evaluar así el impacto ambiental en el tiempo en secuencias sedimentarias recientes de la zona costera.

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The central Alboran Sea active tectonics: implications in seismic hazard of indenter and roll-back interaction

Jesús Galindo-Zaldívar[1, 2], Gemma Ercilla[3], Ferran Estrada[3], José A. Peláez[4], Antonio J. Gil[5, 6], Víctor Tendero-Salmerón[2], Juan Tomas Vázquez[7], Asier Madarieta-Txurruka[1], Lourdes González-Castillo[1]

[1*] Dpto. de Geodinámica, Universidad de Granada, 18071 Granada, Spain, jgalindo@ugr.es
[2] Instituto Andaluz de Ciencias de la Tierra, CSIC-UGR, 18100 Granada, Spain.
[3] Instituto de Ciencias del Mar, CSIC, Continental Margins Group, 08003 Barcelona, Spain.
[4] Departamento de Física, Universidad de Jaén, Spain.
[5] Departamento Ing. Cartográfica, Geodésica y Fotogrametría, Universidad de Jaén, Spain.
[6] CEACTEMA, Universidad de Jaén, Spain.
[7] Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, CSIC, 29640 Fuengirola, Spain.

Key words: *South Iberian margin, faults and folds, migration of deformation, sea-land integration.*

The Alboran Sea constitutes one of the most active margins of Iberia related to the NW-SE convergence of Eurasia and Nubia (Western Africa), that produced the present-day continental collision. The recent evolution of the easternmost Alboran Sea is driven by an indenter tectonics that formed the Aguilas Arc-Vera Gulf and the central Alboran Sea indenters. They have reached different rate of development, sharing several common features: they are bounded by two sets of strike slip faults, NNE-SSW sinistral (generally most active) and NW-SE dextral faults, being associated to folds. In the central Alboran Sea, the prominent Alboran ridge is an ENE-WSW antiform developed by the detached cover on a rigid basement.

The central Alboran Sea indenter determines the main features of the Trans Alboran Shear Zone, a wide deformational strip that concentrates most of the active folds, strike-slip faults and seismicity connecting the Moroccan coast in the Al Hoceima area and the Spanish coast in the Campo de Dalias region. This deformation zone occurs in the western boundary of the central Alboran Sea indenter and is affected by the interaction with roll-back tectonics that produced the deep, low deformed and sinking of the Western Alboran Sea Basin surrounded by the Gibraltar Arc. In this a framework of migration of the deformation, new faults developed westwards of the formed ones. The integration of onshore and offshore geological, seismic, geophysical and geodetical observations is essential to reveal in detail the recent deformation of the region and the interplay of folds and faults.

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Trawling impacts on the distribution of *Funiculina quadrangularis* fields on the Cantabrian Sea and Galicia

Ana García-Alegre[1*], Susana Ruiz-Pico[1], Maider Plaza-Morlote[1], Antonio Punzón[1], Ulla Fernandez-Arcaya[1], Alberto Serrano[1], José Manuel González-Irusta[1]

[1*] Centro Oceanográfico de Santander (COST-IEO), CSIC, Calle Severiano Ballesteros 16, 39004 Santander, Cantabria, España, ana.garciaalegre@ieo.csic.es

Key words: *sea pens, southern Bay of Biscay, fishing, distribution, VMEs.*

The sea pen *Funiculina quadrangularis* is the most abundant characteristic species of Pennatulacean presented in the trawlable grounds of the study area. These communities have been described as vulnerable marine ecosystems (VMEs, Seapen fields) and are currently being protected by international resolutions promoted by organizations like the FAO or OSPAR. In the studied area, the observed low densities of *F. quadrangularis* may be due to the high trawling intensity, highlighting the importance of spatially characterize these communities in the region and better understanding the impact of trawling on them. With this aim, Generalized Additive Models (GAM) were applied in a two steps approach. First, the probability of the presence of *F. quadrangularis* was modelled using a binomial model. Second, the abundance of the species was modelled after removing the zeros from the data. Both models were finally combined to provide a final output showing the density distribution of *F. quadrangularis* in the area. Along with different environmental variables (depth, slope, sedimentological characteristics, and oceanographical information), trawling was included as an explanatory variable in the models. Furthermore, a hypothetical scenario without trawling was also applied to show how the suitable distribution of *F. quadrangularis* may be in the absence of pressure. The study identified depth, organic matter, coarse sand, mud, and trawling effort as important drivers for predicting the presence and the abundance of *F. quadrangularis.* Salinity and current intensity were also recognized as statistically significant for the binomial models. In addition, the scenario without trawling shows the presence of suitability areas in areas currently unsuitable for this specie because of the high levels of trawling. These potential suitability areas of *F. quadrangularis* found in this study can be useful for management purposes as areas to preserve in the future implementation of the different directives related to the protection of the sea.

Acknowledgements. We are grateful to all the participants of the “DEMERSALES” North Spanish Shelf Groundfish Surveys carried out in the Cantabrian Sea and Galicia.

Foraminíferos bentónicos como indicadores del nivel del mar en el estuario del Oka (N España)

Ane García-Artola[1*], Ana Pascual[1], Alejandro Cearreta[1]

[1] Dpto. de Geología, Universidad del País Vasco UPV/EHU, Apartado 644, 48080 Bilbao, España, ane.garcia@ehu.eus

Palabras clave: *microfauna, marisma, llanura intermareal, registro sedimentario, Golfo de Bizkaia.*

La asociación muerta de foraminíferos bentónicos actuales presenta un claro gradiente vertical en el estuario del Oka (N España). Al igual que en el caso de la vegetación halófita, este patrón responde a la duración y frecuencia de la inundación mareal que se produce en los distintos subambientes estuarinos. La marisma alta, colonizada por *Juncus maritimus* y *Halimione portulacoides*, se distribuye entre la máxima pleamar astronómica y la pleamar media observada. Aquí se encuentran exclusivamente foraminíferos de caparazón aglutinante, tales como *Entzia macrescens* y *Trochammina inflata*. Entre la pleamar media y la pleamar muerta media observadas, se desarrolla la marisma baja, estabilizada por especies vegetales como *Salicornia ramosissima*, *Puccinellia maritima* y *Spartina maritima*. En este caso, además de las especies aglutinantes que caracterizan la marisma alta también aparecen formas de caparazón calcáreo hialino (*Ammonia tepida*, *Haynesina germanica* y *Elphidium oceanense*). Por su parte, la llanura intermareal se forma por debajo de la pleamar muerta media observada y está claramente dominada por especies hialinas. En este ambiente disminuye la abundancia relativa de las especies aglutinantes, que son reemplazadas por las de caparazón porcelanáceo (*Quinqueloculina seminulum*). Inundada frecuentemente, esta llanura recibe además abundantes especies alóctonas (principalmente *Lobatula lobatula*) que viven y se reproducen fuera del estuario y que son transportadas dentro del mismo por el oleaje y las corrientes mareales como partículas sedimentarias.

Es posible establecer un límite superior e inferior para las marismas alta y baja, sin embargo, en el caso de la llanura intermareal únicamente podemos establecer su límite superior. Este hecho hace que, a diferencia de las muestras de llanura intermareal, las asociaciones de marisma sean de gran utilidad para la reconstrucción del nivel relativo del mar en el registro geológico reciente. No obstante, al tratarse de una costa de carácter meso-macromareal, los errores obtenidos en dichas reconstrucciones micropaleontológicas pueden llegar a ser de decenas de centímetros. A escala holocena estos errores son asumibles, pero cuando es necesario identificar variaciones menores en el nivel relativo del mar, por ejemplo durante la Pequeña Edad de Hielo o la Anomalía Climática Medieval, es conveniente incluir además otros indicadores.

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Aplicación de bioensayos para predecir y evaluar la toxicidad de sedimentos contaminados en el Golfo de Bizkaia

Nerea Garcia-Velasco[1, 2]*, Jose Antonio Carrero[3, 4], Erik Urionabarrenetxea[1, 2], Beñat Zaldibar[1, 2], Ainara Gredilla[3, 4], Alberto de Diego[2, 3, 5], Urtzi Izagirre[1, 2], Manu Soto[1, 2]

[1] CBET Research Group, Dept. Zoology and Animal Cell Biology, nerea.garcia@ehu.eus
[2] Research Centre for Experimental Marine Biology and Biotechnology, PIE-UPV/EHU.
[3] IBeA Research Group.
[4] Dept. of Applied Chemistry, University of the Basque Country UPV/EHU, Basque Country.
[5] Dept. of Analytical Chemistry.

Palabras clave: *Sedimentos, Metales, Organismos estuarinos, Bioensayos, Test in vitro.*

Los estuarios han estado sometidos a impactos continuos derivados de la actividad humana, provocando su sobreexplotación y contaminación. Así, los sedimentos estuarinos crónicamente contaminados podrían suponen una amenaza ecotoxicológica latente al alterarse las condiciones fisicoquímicas del medio. Por lo tanto, existe la necesidad de una adecuada evaluación de los efectos adversos asociados a los sedimentos contaminados. En este trabajo se han estudiado la transferencia y flujos de metales entre el sedimento, columna de agua y biota para entender la interacción y biodisponibilidad de contaminantes. Por otro lado, con el objetivo de hacer una evaluación integrada de la contaminación en estuarios, se han desarrollado y aplicado bioensayos con especies ecológicamente relevantes en estuarios (poliquetos, erizo de mar, mejillones). En un primer lugar se validaron los bioensayos *in vivo* e *in vitro* con el poliqueto *Hediste diversicolor* y sus células inmunitarias (celomocitos), comparando los umbrales de toxicidad con los de las larvas de erizo de mar (*Paracentrotus lividus*). Posteriormente se aplicaron estos ensayos para evaluar la toxicidad de sedimentos recogidos en diferentes puntos de los estuarios Nerbioi-Ibaizabal, Butron, La Gironde y Charente en diferentes épocas del periodo 2018-2019. Todos los sedimentos recogidos fueron arcillosos y con alto contenido en materia orgánica (>3%), mostrando los puntos de Udondo y Benedicta (Nerbioi-Ibaizabal) la mayor concentración de metales. Tras exponer los poliquetos a los sedimentos de estos puntos se observaron mayor acumulación de metales en tejido y alteraciones histopatologías. Asimismo, los test *in vitro* con celomocitos y larvas de erizo de mar indicaron un descenso en la viabilidad celular y una menor capacidad de crecimiento y malformaciones en los embriones, respectivamente. La metodología desarrollada para los test *in vitro* (obtención de células, exposición a elutriados, test de viabilidad) demostró capacidad para predecir sedimentos contaminados de forma rápida (24-48h). La aplicación de estos nuevos ensayos podría ser de gran utilidad para la gestión ambiental de los estuarios, incluyendo Directrices sobre la calidad de los sedimentos y regulación de operaciones de dragado.

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Señales antropogénicas en el registro sedimentario reciente del interior de la Ría de Ferrol (Galicia, NO España)

Jon Gardoki[1*], Alejandro Cearreta[1], Ane García-Artola[1], María Jesús Irabien[1], José Gómez-Arozamena[2], Víctor Villasante-Marcos[3]

[1*] Departamento de Geología, Universidad del País Vasco UPV/EHU, 48940 Leioa, Spain, jon.gardoqui@ehu.eus
[2] Departamento de Ciencias Médicas y Quirúrgicas, Universidad de Cantabria, 39011 Santander, Spain.
[3] Observatorio Geofísico Central, Instituto Geográfico Nacional, 28014 Madrid, Spain.

Palabras clave: *Foraminíferos, Granulometría, Susceptibilidad magnética, Radionúclidos.*

La Ría de Ferrol (Galicia, NO España) es un valle costero elongado dominado por las mareas que ha experimentado fuertes modificaciones antrópicas debido a la expansión de las actividades portuarias y el desarrollo industrial, particularmente desde la década de 1950. Estas actividades han transformado el estuario físico-químicamente, dando lugar a diversas señales que han quedado registradas en sus sedimentos. Dentro de este contexto, se ha analizado el registro sedimentario reciente del interior de la Ría de Ferrol a través de un enfoque multidisciplinar (foraminíferos bentónicos, cambios granulométricos, susceptibilidad magnética y actividad de radionúclidos) de dos sondeos intermareales de 50 cm de longitud recuperados en las localidades de Neda y Fene en el año 2021. Ambos sondeos están caracterizados por la dominancia de sedimentos fangosos que sugiere un ambiente deposicional de baja energía. Las asociaciones de foraminíferos, principalmente constituidas por *Eggerelloides scaber*, *Haynesina germanica* y *Ammonia tepida*, con abundancias secundarias de especies pertenecientes a los géneros *Elphidium* y *Cribroelphidium*, indican un ambiente transicional rico en materia orgánica. Se han identificado intervalos de muy baja abundancia de foraminíferos (<100 caparazones/32g) que podrían responder a procesos de disolución de los caparazones carbonatados y disgregación de los taxones aglutinantes, así como a unas condiciones ecológicas degradadas. Además, utilizando la actividad del radionúclido natural ^{210}Pb, se ha observado un incremento significativo en las tasas de acumulación sedimentaria, particularmente durante las últimas décadas. Los perfiles verticales de la susceptibilidad magnética, por su parte, muestran un patrón relativamente homogéneo, caracterizados por valores comparativamente bajos. Los estudios multidisciplinares en curso permitirán la identificación de los procesos costeros antropogénicos y naturales que gobiernan el registro sedimentario reciente de esta ría.

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The relation between currents and Meagre ("Corvina") migration patterns along the southern Portuguese coast

Erwan Garel[1*], Luciano de Oliveira Júnior[1], David Abecasis[2]

[1] Centro de Investigação Marinha a Ambiental (CIMA), Universidade do Algarve, Faro, egarel@ualg.pt
[2] Centro de Ciências do Mar (CCMAR), Universidade do Algarve, Faro, Portugal.

***Key words**: Gulf of Cadiz, HFR, ADCP, acoustic telemetry, fish behaviour.*

The meagre *Argyrosomus regius* ("Corvina") is a large benthopelagic fish with high economic value, found in the Northeastern Atlantic from France to Congo, and in the Mediterranean. It inhabits coastal waters (from 15 to 150 m depth) with temperature ranging between 13º and 28ºC. Based on acoustic detections from receivers placed at 4 stations between Cape São Vicente (CSV) and Cape Santa Maria (CSM) in 2019-2020, this work evaluates the relationship between meagre's migration pathways and current direction along the south Portuguese coast. In the region, tidal currents are mainly cross-shore while subtidal flows are alongshore with balanced (eastward and westward) directions that alternate twice a week on average.

Hourly velocity data are available from several ADCP moorings at one station near CSM (in 23 m water depth) and HFR data covering the shelf with 1 km resolution. The alongshore circulation (represented by the east flow component) was compared with the direction of Meagre migration derived from pairs of acoustic detections occurring in less than 3 days at distinct receiver stations. Twenty-five fish transits were identified between March 2019 and October 2020, occurring mostly (80%) during the upwelling season (May-October). The transits were mostly westward as the fish were tagged near CSM (i.e., the most eastern receiver location) and often occurred at the same time for several fishes, suggesting a reaction to an environmental trigger. Most (21) of the migrations took place at periods with flow velocity > 10 cm/s, corresponding to a relatively strong and continuous circulation along the entire coast. Remarkably, 19 of the 25 migrations (76%) were performed with favorable currents. A Phi test indicated a strong positive relationship (Phi= 0.46) between current and migration directions, while the one-tailed Fisher's exact test shows that the association between westward flow and migration from CSM to CSV is true (i.e., not random) at 96%. Opposed to expectations, the observation of concomitant satellite derived SST maps shows that meagre often migrates toward colder water. The environmental drivers of fish migrations are now being investigated. We hypothesize that meagre takes advantage of warm westward flows to reach CSV where a large food stock is available due to strong upwelling activity during the few preceding days.

Comunidades macrobentónicas en campos de pockmarks frente a la costa vasca (SE Golfo de Vizcaya)

Joxe Mikel Garmendia[1*], Ibon Galparsoro[1], Iñigo Muxika[1], José Germán Rodríguez[1], Beatriz Arrese[2], Irene P. Díez-García[2], María Gómez-Ballesteros[2], Francisco Sánchez[3]

[1*] AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Herrera Kaia, Portualdea z/g, 20110 Pasaia, Spain, jgarmendia@azti.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Madrid (IEO-CSIC), Spain.

[3] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain.

Palabras clave: *Cañón Capbreton, diversidad biológica, fondo blando, fauna macrobentónica.*

A pesar de conocer la presencia de pockmarks en las proximidades del cañón de Capbreton, hasta la fecha se han realizado pocos estudios faunísticos sobre ellos, por lo que aún se desconocen muchas de sus características. ¿Cuál es la composición faunística en los pockmarks del sudeste del Golfo de Vizcaya? ¿Son diferentes la fauna del interior y la del exterior de los pockmarks? ¿Hay macrofauna característica en estos fondos?

Los pockmarks frente a la costa vasca (sudeste del Golfo de Vizcaya) se encuentran en una zona con pendiente moderada (4%) a profundidades entre 330 y 1150 m. Estos campos de pockmarks ocupan un área total de 320 km^2, donde se observan desde pequeños pockmarks de diámetro inferior a 20 m, hasta grandes pockmarks de 200-600 m de diámetro.

En el presente estudio se describe y compara la macroinfauna hallada en seis pockmarks y cinco puntos de referencia (cercanos, pero fuera de dichos pockmarks) en el sudeste del Golfo de Vizcaya, cerca del cañón de Capbreton, cubriendo un rango de 413-956 m de profundidad. Las muestras de sedimento fueron tomadas en 2011 y 2019 con una draga Smith-McIntyre de 0,1 m^2 de superficie, analizándose la fauna retenida en un tamiz de 1 mm de luz de malla.

No se observan diferencias llamativas entre los puntos comparados, con una composición sedimentológica similar: promedio de finos 85-80% y materia orgánica 4-3,7%. Los parámetros estructurales de la macrofauna tampoco evidencian diferencias destacables, con los siguientes valores promedio dentro y fuera de pockmarks, respectivamente: densidad de 398 y 330 ind·m^{-2}; biomasa de 1,77 y 1,18 g·m^{-2}; riqueza específica de 24 y 21 especies; diversidad (H' de Shannon) de 2,02 y 1,92 bit·m^{-1}; y equitatividad (J de Pielou) de 0,72 y 0,68. El filo mejor representado corresponde al de anélidos, seguido por moluscos y sipuncúlidos.

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IMPALHA: Diagnosis of the Impact of Bottom Longlines on benthic habitats

M. Huerta[1*], V. Duque-Nogal[1], M. Ruíz[1], P. Verisimo[1], J. Polo[1], M. Blanco[1], P. Carrillo[1], I. Gutiérrez[1], D. Cano[1], M. Sáinz[1], U. Fernández-Arcaya[1], F. Sánchez[1], M. Gómez[2], P. Martín-Sosa[3], A. Serrano[1], I. Galparsoro[4], A. Punzón[1]

[1] Centro Nacional Instituto Español de Oceanografía, CO Santander, 39004 Santander, Cantabria, maria.huerta@ieo.es

[2] Centro Nacional Instituto Español de Oceanografía, CO Madrid, 280002 Madrid.

[3] Centro Nacional Instituto Español de Oceanografía, CO Canarias, 38180 Santa Cruz de Tenerife, Canarias.

[4] AZTI, 20110 Pasaia, Gipuzkoa.

***Key words**: Site of Community Interest, Avilés Canyon System. fishing, management plans characterization.*

The goal of the IMPALHA Project is the diagnosis of the impact of bottom longline gear (hook fishing gear) on the seabed (benthic habitats). The project will be develop in two periods, in this first period characterizing bottom longline fisheries and their interaction with the Natura 2000 network Benthic Habitats in the SCIs (Site of Community Interest) Avilés Canyon System and the future SCI of Cap Bretón. Based on this characterization, an experimental BACI (Before-After Control-Impact) survey will be designed, which consists to analyze the environmental status of a specific area before and after being impacted under controlled condition by the bottom longline gear.

Most studies have been focused on analysing the impact of bottom-trawl gear on the seabed, there are few studies evaluating the effect of passive gears such as longlines. IMPALHA arises with the spirit of contributing to the knowledge of the interaction between different fishing activities other than trawling and the benthic habitats. The results of this project will be essential for the future participatory management plans of the SCIs of the entire Spanish Exclusive Zone. In addition, its results will have international relevance, they can be used to quantify the area adversely affected by this fishing gear in seabed habitats.

One of the most relevant aspects of the project will be the informative aspects. The creation of audio-visual material is planned in order to publicize the methodologies and concepts used in managing the impact of human activities on benthic habitats and interactive activities with the fishing sector. These activities will basically consist of conducting interviews with the sector with the aim of making surveys aboard longline vessels, and in a participatory workshop at the end of the Project that promotes the exchange of knowledge and experience between management, fishing and science.

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SMRM vs SLAMM: A comparison between two rule-based models of marsh response to sea-level rise

Miguel Inácio[1*, 2], Ana Graça Cunha[1, 2], Maria da Conceição Freitas[1, 2], Vera Lopes[1, 2], Manel Leira[2, 3], César Andrade[1, 2]

[1*] Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Piso 3, Campo Grande, Lisboa, Portugal, mfinacio@fc.ul.pt

[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Edifício Campo Grande, Lisboa, Portugal.

[3] BioCost Research Group, Facultade de Ciencias and Centro de Investigacións Científicas Avanzadas, Universidade de A Coruña, A Coruña, Spain.

Key words: *Climate change, Accretion rates, Estuaries, Intertidal areas, Matlab.*

Salt marshes are intertidal coastal environments valued for different services and extremely vulnerable to climate change, particularly to sea-level rise (SLR). Numerical and rule-based models are powerful tools to project the evolution of marsh areas until the end of the century. To accomplish that, the authors developed a reduced complexity two-dimensional rule-based model of marsh response to SLR named Simplified Marsh Response Model (SMRM) that requires the input of four parameters: (1) a high-resolution digital terrain model, representing both the target marsh area and adjacent surfaces (e.g., tidal flats and dunes) with an acceptable spatial range, resolution and quality; (2) critical tidal levels, representing transition between main intertidal environments and supratidal and subtidal areas; (3) at least one SLR projection, including and initial rate and an optional SLR acceleration value; (4) representative accretion rates for high marsh, low marsh and tidal flat domains, which can remain invariant over time or change throughout the century. The SMRM can put together data from different sources (i.e., field, laboratory, monitoring, physical and remote sensing data). To evaluate the performance of the model, two different approaches were considered: a sensitivity analysis and a comparison between SMRM and SLAMM (Sea-level Affecting Marsh Model – Warren Pinnacle Consulting, Inc, Warren VT, Washington, WA, USA), a more complex and well-known rule-based model. This comparison was done for Caldeira de Tróia salt marshes (Sado estuary, Portugal – 40 km south of Lisbon). The results project a major area reduction for the test areas when serious SLR scenarios are considered. The studied marshes seem to be resilient to moderate SLR scenarios. The first signal of the inability of these areas to respond to SLR is the loss of maturity. The comparison between SMRM and SLAMM indicates that the models produce similar results, with less 3% of difference in area until the end of the century. The main conclusion for this abstract is that a simpler rule-based model can produce reliable results with less parameters considered in the study area.

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El plástico en los sedimentos: Detección y caracterización mediante tomografía axial computarizada (TAC)

Eneko Iriarte[1*], Ana Cristina de Dios Blazquez[1]

[1*] Laboratorio de Evolución Humana-IsoTOPIK Stable Isotope Laboratory, Edificio I+d+i, Plaza Misael Bañuelos s/n, Universidad de Burgos, 09001 Burgos, Spain, eiriarte@ubu.es

Palabras clave: *Plásticos, contaminación, detección, caracterización, tomografía axial computarizada (TAC).*

El abuso en la utilización de plásticos ha llevado a su presencia como contaminante en todos los ecosistemas y ambientes deposicionales, tanto continentales como marinos, siendo los ambientes fluviales, costeros y marinos los que muestran un mayor contenido de contaminantes plásticos. Son numerosas las propuestas de metodologías y técnicas propuestas para la detección, cuantificación y medida del efecto de este contaminante en los distintos ambientes y ecosistemas, no obstante, es necesario la implementación de métodos y propuestas estandarizadas y de nuevas técnicas analíticas que mejoren las carencias de las utilizadas hasta la fecha.

En esta comunicación se presentan los resultados de una nueva técnica de detección y caracterización de partículas de diferentes tipos de plásticos mediante la utilización de la tomografía axial computarizada (TAC). La metodología de análisis explorada en este trabajo busca detectar y caracterizar los distintos tipos de plásticos tanto exentos (p.ej. plásticos flotantes en el mar, lagos, ríos, etc.) como englobados en sedimento (p.ej. arenas de playa, sedimentos lacustres, etc.). Para ello se ha realizado un programa experimental de análisis de partículas de los tipos de plásticos más comunes: PP (polipropileno), PEBD (polietileno de baja densidad), PEAD, (polietileno de alta densidad), PVC (cloruro de polivinilo), PET (polietileno tereftalato), PS (poliestireno de distintas características) y PA (poliamidas de distintas características). Se han obtenido resultados preliminares positivos y que muestran el gran potencial de esta técnica para detectar y clasificar distintos tipos de partículas plásticas, especialmente en tamaños superiores a 2 mm, tanto exentos como englobados en sedimento. La diferenciación de los distintos tipos de plásticos permite diferenciarlos según su densidad, tamaño y morfología; pudiendo afirmarse, en general, que la diferenciación de distintos tipos/grupos de plásticos mediante TAC es viable y solventa algunas de las limitaciones de los métodos analíticos más utilizados en la actualidad.

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Características geomorfológicas, sedimentarias y cronológicas de la paleocosta del Último Máximo Glaciar en la plataforma continental cantábrica (Golfo de Bizkaia)

Eneko Iriarte[1*], Jesús Rivera[2], Miren del Val[3], Peru Bilbao[4], Alejandro García Moreno[5], Viola Bruschi[6], Luis Teira[5], Pablo Saiz Silió[5], Esteban Álvarez-Fernández[7], Miguel Ángel Sánchez Carro[6], Roberto Ontañón[5, 8], Pablo Arias Cabal[5]

[1*] Laboratorio de Evolución Humana-IsoTOPIK Stable Isotope Laboratory, Edificio I+d+i, Plaza Misael Bañuelos s/n, Universidad de Burgos, 09001 Burgos, Spain, eiriarte@ubu.es
[2] Instituto Español de Oceanografía- Servicios Centrales, C/Corazón de María 8, 28032 Madrid, Spain.
[3] CENIEH, Pº Sierra de Atapuerca 3, 09002, Burgos.
[4] Dpto. Geología, Facultad de Ciencia y Tecnología, UPV/EHU, Barrio Sarriena s/n, 48940 Leioa.
[5] IIIPC, Edificio Interfacultativo, Av. de los Castros 52, 39005 Santander, Spain.
[6] Universidad de Cantabria, IIIPC (Gobierno de Cantabria, Universidad de Cantabria y Santander). Escuela de Ing. de Caminos, Canales y Puertos, Avda. de los Castros s/n, 39005 Santander, Spain.
[7] GIR PREHUSAL, Dpto. Prehistoria, Historia Antigua y Arqueología, Universidad de Salamanca, 37002 Salamanca, Spain.
[8] Museo de Prehistoria y Arqueología de Cantabria, 39009 Santander, Spain.

Palabras clave: *Transgresión, Pleistoceno superior, sedimentos costeros, sísmica de reflexión, sondeos.*

La campaña oceanográfica PALEOSUB (año 2020) tuvo como objetivo la realización de una cartografía batimétrica mediante sonda multihaz y perfilaje sísmico de reflexión de alta resolución, así como transectos de muestreo de sedimento y roca mediante draga y sondeos, en varios sectores de la plataforma continental del mar Cantábrico; más concretamente entre las desembocaduras del río Sella (Ribadesella, Asturias) al este y el río Agüera (Oriñón, Cantabria) al oeste. La batimetría de alta resolución del lecho marino mediante sonda multihaz y del subfondo mediante sonda paramétrica, permitió identificar los paleopaisajes ligados al último ascenso eustático en la plataforma continental cantábrica, así como los depósitos sedimentarios marinos asociados a dicha transgresión.

Así, en los sectores adyacentes a la desembocadura de los ríos Escudo (San Vicente de la Barquera), Pas (Liencres) y Asón (Laredo) se detectaron litosomos de arenas característicamente gruesas y bioclásticas, a profundidades de entre 90 y 110 m, normalmente adosados a relieves submarinos de orden decimétrico constituidos por relieves rocosos submarinos formados por unidades de litologías duras (p. ej. calizas). La toma de muestras de sedimento de dichos litosomos mediante dragas y sondeos (vibrocorer) de hasta 4 m de profundidad han permitido la caracterización de los sedimentos arenosos y una primera aproximación cronológica mediante luminiscencia óptica (OSL). El conjunto de datos obtenidos permite datar la formación de los litosomos arenosos profundos en cronologías cercanas al Último Máximo Glaciar (*ca.* 21-15 ka), durante el nivel marino más bajo del último ciclo glaciar (MIS2) y su adscripción a un medio sedimentario costero somero y sometido a la acción del oleaje (*foreshore-shoreface*), indicando así la localización de la paleocosta a inicios de la última transgresión.

Agradecimientos. A toda la tripulación del buque oceanográfico Ramón Margalef (IEO) y el IIIPC que hizo posible la realización de la campaña a pesar de la pandemia del COVID19.

Late Cretaceous post-rift fault activity in the eastern Basque-Cantabrian Basin: stratigraphic review and new evidence of submarine breccias

Martin Ladron de Guevara[1*], Arantxa Bodego[1], Eneko Iriarte[2]

[1*] Dpt. of Geology, Faculty of Science and Technology, University of the Basque Country (UPV/EHU), 48940 Leioa (Bizkaia), Spain, martin.ladrondeguevara@ehu.eus

[2] Laboratory of Human Evolution, History, Geography & Communication Dpt. – IsoTOPIK Stable Isotope Laboratory, Edificio de I+D+I, Universidad de Burgos, Plaza Misael Bañuelos s/n, 09001 Burgos, Spain.

Key words: *submarine gravitational deposits, planktonic foraminifera, biostratigraphy, tectonism, Basque massifs.*

The Upper Cretaceous hemipelagic and turbiditic rocks of the Basque-Cantabrian Basin are considered to have been deposited in a transgressive context during the Cretaceous post-rift thermal subsidence. Adjacent to the Ereñozu fault, which was the northwest margin of the Bortziriak-Cinco Villas massif during the Cretaceous rifting, breccia and conglomerate deposits are intercalated in the Cenomanian-Santonian sedimentary record. The aim of this work is to review previous works and to complete the data with new field evidences, mapping, stratigraphic logs and biostratigraphic dating. The cartographic data shows the continuous character of the interval of breccias and conglomerates even above the Albian-Cenomanian Oiartzun anticline and Fagollaga dome. Despite that interval is usually intercalated within the Upper Cretaceous hemipelagic marls, locally, the breccias lie above the Upper Albian-Lower Cenomanian detrital materials on an angular unconformity or disconformity. The breccia units are made up of massive metric beds of polymictic ortho- and parabreccias of angular clasts, conglomerates, olistoliths, slumps, turbidites, sandy limestones and sandy marls of variable thickness and grain size. Lithoclasts are of variable lithologies and ages, including Palaeozoic, Permo-Triassic, Jurassic and upper Albian rock fragments, as well as Cenomanian-Turonian limestone lithoclasts and Upper Cretaceous remobilised and incorporated soft clasts. Locally, the breccia beds show a reverse clast stratigraphy. The sedimentological, stratigraphic, cartographic and structural analysis suggests the gravitational character of the deposits, derived from submarine fault scarps due to collapsing events and deposited at the toe of slope during Turonian to Santonian times. The geological analysis of these fault scarp-derived breccias leads us to consider the tectonic activity of basement faults in the northwestern margin of the Bortziriak-Cinco Villas massif during the post-rift phase of the Cretaceous Basque-Cantabrian – Pyrenean rift system.

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Preliminary characterization of the benthic megafaunal communities of the deep-sea canyon Ribeira Brava, south of Madeira Island

Jorge Lobo-Arteaga[1*, 2], Clara Lopes[1], Manuel Seixas[3], Cátia Bartilotti[1, 2], Miriam Tuaty-Guerra[1, 3]

[1] Instituto Português do Mar e da Atmosfera, I.P. (IPMA), Av. Alfredo Magalhães Ramalho 6, 1495-165 Algés, Portugal, jorge.arteaga@ipma.pt

[2] Centro de Ciências do Mar e do Ambiente (MARE), Universidade NOVA de Lisboa, Campus de Caparica, 2829-516 Caparica, Portugal.

[3] Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR), Universidade do Porto, Terminal de Cruzeiros do Porto de Leixões, 4450-208 Matosinhos, Portugal.

Key words: *Benthic habitats, Biodiversity, Deep-sea megafauna, Madeira Archipelago, ROV LUSO system.*

The oceanographic campaign CRISTA MADEIRA-TORE 2021 was carried out onboard the research vessel Mário Ruivo, from November 20th to December 4th, in order to collect environmental data of the Atlantic ocean in the Madeira-Tore Rise region. The deep-sea canyon Ribeira Brava, located south of the Madeira Island, was surveyed through transects carried out by ROV LUSO. Videos and images were recorded from 708 to 624 m and from 1485 to 1333 m depth, respectively, in a total of 11 hours. Sediment and water samples were collected using suction samplers and corers, respectively. Rock and organism samples were collected, stored, and preserved for analysis in the laboratory. Video and image analysis showed that in both transects bottom substrates have a similar composition, mainly sandy-mud sediments with banks of hard and mixed substrates. The deepest habitat was dominated by a dense field of xenophyophores, agglutinated Foraminifera (Protista) in both soft and hard substrates. Also, diverse and sparse megafaunal communities were observed, mainly composed of hydrozoan, anthozoan soft and stony corals (orders Actiniaria, Alcyonacea, Antipatharia, e Pennatulacea), incrusting and massive sponges (classes Demospongiae and Hexactinellida), teleost fish (orders Anguilliformes, Gadiformes, Scorpaeniformes, and Notacanthiformes), echinoderms (classes Echinoidea, Asteroidea, Holothuriida, and Crinoidea), gastropod molluscs, decapod crustaceans (families Aristeidae, Majidae) and cirripeds (order Scalpellomorpha). Marine litter was also identified (e.g. plastic fragments and cables, glass bottles and a ceramic creel to catch crustaceans), revealing anthropogenic pressures in these benthic habitats. In order to validate the image data, the collected organisms still need to be analyzed through integrative taxonomy (morphology and DNA barcode).

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Organic matter in intertidal estuarine margins: The case of Tróia (Sado estuary, Portugal)

Vera Lopes[1*, 2], Maria da Conceição Freitas[1, 2], Manel Leira[3], Miguel Inácio[1, 2]

[1*] Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Piso 3, Campo Grande, 1749-016 Lisboa, Portugal, vplopes@fc.ul.pt

[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Piso 3, Campo Grande, 1749-016 Lisboa, Portugal.

[3] BioCost Research Group, Facultade de Ciencias and Centro de Investigacións Científicas Avanzadas, Universidade de A Coruña, A Coruña, Spain.

***Key words**: Biogeochemistry, Elemental analyses, C and N isotopes, Tidal marshes, Tidal flats.*

Coastal environments like tidal marshes and flats are very important as they support enormous biodiversity and provide several services such as coastline protection, retention of pollutants, and organic carbon sequestration, having considerable potential to mitigate climate change. The study of these ecosystems is of huge importance to know their dynamic relatively to minerogenic sedimentation and organic matter deposition and consequently organic carbon sequestration, sources, and sinks.

The study area locates in the Sado estuary which is a Mediterranean estuary located 40 km south of Lisbon with a submerged area of 200 km^2. This estuary is separated from the Atlantic Ocean by the Tróia sandspit, which trends NNW-SSE and is 25 km long. Along the estuarine margin of this barrier tidal marshes and flats occur, in discontinuous patches between Caldeira de Tróia and Comporta.

This work pretends to characterize the organic matter deposited in the high marsh (HM), low marsh (LM), and tidal flat (TF), neighboring environments with differences in height, vegetation, and submersion time. Surface sediment samples were collected in the different Tróia sandspit marshes in a total of 83 (46 HM; 21 LM; 16 TF). Samples were freeze-dried and analyzed for calcium carbonate and organic matter content, N and C elemental, and isotopes.

Results show that samples have null values of $CaCO_3$. Mean (maximum; minimum) values were obtained as follow: organic matter (%): 26 (44; 4) in HM, 14 (18; 9) in LM and 6 (9; 3) in TF; $^{\delta 13}$C (‰): -20.27 (3.73; -26.54) in HM, -19.08 (-15.8; -25.01) in LM and -19.71 (-18.6; -20.8) in TF; $^{\delta 15}$N (‰): 3.8 (6; -0.04) in HM, 4.08 (5.6; -0.23) in LM and 4.6 (5.3; 3.7) in TF; %C: 8.6 (21.4; 0.82) in HM, 5.13 (13.12; 0.42) in LM and 1.7 (2.62; 0.71) in TF; %N: 0.89 (2.07; 0.07) in HM, 0.54 (1.11; 0.05) in LM and 0.21 (0.40; 0.10) in TF. In conclusion, organic matter content and elemental values are the most different characteristics of the sub-environments (HM, LM, TF). In what concerns isotopic characterization, the environmental discrimination is less evident, especially between low marsh and tidal flat.

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First approach to organic carbon quantification and sediment characterization in the Minho estuary marshes

Vera Lopes[1*, 2], Xose. L. Otero[3], Maria da Conceição Freitas[1, 2]

[1*] Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Piso 3, Campo Grande, 1749-016 Lisboa, Portugal, vplopes@fc.ul.pt

[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Edifício C6, Piso 3, Campo Grande, 1749-016 Lisboa, Portugal.

[3] Departamento de Edafoloxía e Química Agrícola, Facultade de Bioloxía, Universidade de Santiago de Compostela, Galicia, Spain.

***Key words**: Blue carbon, organic matter, biogeochemistry, sedimentology, C and N elemental and isotopes.*

Marshes are one of the three (mangroves, marshes, and seagrasses) most critical coastal ecosystems for carbon sequestration and storage. They are essential for coastal preservation as they provide numerous ecosystem services that support coastal communities worldwide and have considerable potential to mitigate climate change. Organic carbon sequestered from the atmosphere by coastal ecosystems is described as blue carbon, and its quantification as well the organic matter characterization is very important.

The study area, marsh ecosystems, locates at Minho estuary, with a surficial area of 500 ha, on the northwest Portuguese coast, on the left margin of the Minho river and Coura (a tributary of the Minho River) marshes.

This work aims to quantify the blue carbon stored at the Minho/Coura marshes and characterize the marsh sediments and the associated organic matter. To achieve this objective, a field campaign was carried out in February 2022 to sample, in six marsh patches, the plant biomass of the different plant species (aboveground biomass, litter (death plant biomass), and belowground biomass (root and rhizome biomass)) and to collect the respective geological substrates (sediments) to determine surficial and in-depth bulk density. Also, physical soil parameters (pH and ORP) measurements were taken *in situ*. Afterward, sedimentological analysis (grain size, calcium carbonate and organic matter content, mineralogical clay identification by RX. Diffraction) and organic chemistry analysis (C and N elemental and isotopic analysis) of sediments and plant biomass were performed. This work is the first approach to blue carbon quantification in Minho/Coura estuary and to the characterization of the sources of organic matter.

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Hyperextension and break-up along the Bay of Biscay and inversion in the North-Iberian Margin (NIM)

Asier Madarieta-Txurruka[1*], Antonio Pedrera[2], Jesús Galindo-Zaldívar[1, 3], Ferrán Estrada[4], Jesus García-Senz[2], Gemma Ercilla[4]

[1*] Departamento de Geodinámica, Universidad de Granada, 18071 Granada, Spain, amadatxu@ugr.es
[2] Instituto Geológico y Minero de España (IGME), CSIC, 41013 Sevilla, Spain.
[3] Instituto Andaluz de Ciencias de la Tierra (IACT), CSIC-UGR, 18100 Granada, Spain.
[4] Instituto de Ciencias del Mar (ICM), CSIC, 08003 Barcelona, Spain.

Key words: *Cross-section balancing, Rifting, Supradetachment basin, Mantle exhumation, Buttressing.*

The North-Iberian/Armorican conjugated margins flanking the Bay of Biscay are the results of a partly inverted hiperextensional rift system, that allow to explore both the extensional processes of the attenuation of the lithosphere and the effect of the later contractional reactivation. Crustal-scale balanced cross-sections deliver a robust geological and geophysical reference framework for testing kinematic models of extension and orogenic inversion. We present a restored NNE-SSW cross-section from Duero Basin to Armorican Platform, crossing the Cantabrian Mountains, the Asturias Basin and the Bay of Biscay. In this new proposal a system of southward-dipping faults that sole into a crustal-scale detachment determine the extensional evolution of the margin. The Asturias Basin, characterized by a synformal shape, is one of the largest offshore depocenters of the Biscay-Pyrenean rift system and is interpreted here as a supradetachment basin.

The restoration differentiates five main phases: a) Rifting leds the formation of the Asturias Basin due to a southward-dipping crustal scale fault with ramp/flat geometry coeval to the progressive linking and rotation of normal faults in the basin axis (Kimmeridgian-Valanginian). b) Crustal Necking causes the first exhumation of mantle along the Bay of Biscay axis (M3; 130-128 my) progressively migrating to the south (M0; 125 my). Subsidence continues in the Asturias Basin while the lower crust undergoes ductile deformation and exhumation in Le Danois High (Hauterivian-Barremian). c) Widening of the exhumed mantle domains. The Asturias Basin is passively transported toward the south accompanied by moderate subsidence and deformation (Aptian-middle Albian). d) Proto-oceanic spreading in the South-Gascony Ridge. The asthenosphere almost reaches the ocean floor accompanied by post-rift subsidence in the conjugate margins (middle Albian-Santonian). e) The NIM Inversion, dominated by thick-skinned tectonics, is characterized by a double-vergent thrust system. Exhumed and shallow lithospheric mantle domains acted as rigid buttress. Southward-dipping low-angle normal faults were inverted at the toe of Le Danois High at the same time that the Duero N-thrust promoted the formation of the Cantabrian Mountain in its hanging-wall (Oligocene-Miocene).

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Cyanobacterial blooms affecting circalittoral vulnerable benthic communities in the Canary Islands

Laura Martín-García[1*], Marcos González-Porto[1], Jesús M. Falcón[1], Erika González[1], Sebastián Jiménez[1], Noemí Dionis[1], Nereida Rancel[2], Marta Sansón[2], Pablo Martín-Sosa[1]

[1*] Centro Oceanográfico de Canarias, Instituto Español de Oceanografía-CSIC, Canary Islands, Spain, laura.martin@ieo.csic.es

[2] Departamento de Botánica, Ecología y Fisiología Vegetal, Universidad de La Laguna, Canary Islands, Spain.

Key words: Lyngbya *sp., benthos, harmful algae, Fuerteventura, Canary Islands.*

Algae blooms are becoming more frequent throughout the world, causing significant impacts on the environment and even on human health. Benthic cyanobacteria, such as the species of the genus *Lyngbya* C.Agardh ex Gomont, are one more component of the communities of intertidal and subtidal habitats of all the oceans. Nevertheless, these species present the ability to grow rapidly under certain conditions, even forming blooms that dominate the habitat, and eventually, may affect the rest of the species in the community harmfully. In this study, we present the results of an oceanographic survey carried out on the southern coasts of Fuerteventura and Lanzarote in November 2021, where the massive presence of *Lyngbya* sp. (species yet to be confirmed genetically) was detected on circalittoral bottoms and at depths greater than 100 m. Dense populations of this species were recognized visually, sampling with ROV-T Tasife, and were also identified by live samples collected with the Liropus ROV. *Lyngbya* populations presented different colors, mainly depending on the depth, being dark red in the shallowest waters at 80 m and whitish at around 150 m. The accumulations of filaments of this alga overgrown the bed and all the benthic species found there, especially some vulnerable habitat-forming species: cnidarian species such as the black corals *Antipathes furcata*, *Antipathella wollastoni* or *Stichopathes gracilis*, or sponges such as different species of the Axinellidae family. This is the first study assessing the impact of the algae bloom on the circalittoral benthic environment of the Canary Islands.

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Distribution of recent planktonic foraminifera in surface sediments of the Basque shelf (S Bay of Biscay): oceanographic implications

Blanca Martínez-García*[1], Ana Pascual[2], Julio Rodríguez-Lázaro[2], Arantxa Bodego[2]

*[1] Instituto Geológico y Minero de España (IGME-CSIC). C/ Ríos Rosas 23, 28003, Madrid, blanca.martinez@igme.es

[2] Departamento de Geología, Universidad del País Vasco (UPV/EHU), B. Sarriena, 48940 Leioa, Bizkaia.

Key words: *microfauna, oceanic currents, upwelling, Cantabrian Sea, N Spain*

In this work we describe for the first time the distribution of planktonic foraminifera assemblages preserved in recent surface sediments that cover the Basque shelf (southern Bay of Biscay) and their relationship with diverse oceanic currents that affect this area. In the 83 studied samples 18 (morpho)species of planktonic foraminifera have been identified, being the most abundant species: *Neogloboquadrina pachyderma* dex., *Globigerinoides ruber*, *Globigerina bulloides*, *Globoconella inflata*, *Orbulina universa* and *Turborotalita quinqueloba*. These species represent 92.8% of the total hand-picked specimens. The preferential accumulation of planktonic foraminifera shells in fine sediments deposited in the eastern margin of the Basque shelf, and the random distribution of the dominant species in this area, seem to respond to the general surface current that affects the Basque shelf, which flows eastward during most of the year. Moreover, the input of certain currents and deep-water masses in this area has an important impact on assemblage distribution. Thus, abundant *Globigerinoides ruber* individuals, indicate the entrance of the relatively warm and salty Iberian Poleward Current (IPC). Likewise, the dominance of subpolar species *Globigerina bulloides, Neogloboquadrina pachyderma* dex. and *Turborotalita quinqueloba*, together with the occurrence, as accessories species, of *Neogloboquadrina pachyderma* sin., *Globorotalia scitula*, *Globorotalia truncatulinoides* and *Neogloboquadrina dutertrei*, suggest the impact of upwelling processes on the Basque shelf.

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Nuevo Atlas Geológico Digital del Margen Continental Ibérico Atlántico

Teresa Medialdea[1*], Luis Somoza[1], Francisco Javier González[1], Ana Lobato[1], Egidio Marino[1]

[1*] Instituto Geológico y Minero de España, CSIC; Madrid, España, t.mediladea@igme.es

Palabras clave: *Cartografía geológica, Recursos marinos, Margen Continental, Océano Atlántico.*

El conocimiento geológico del territorio sumergido es fundamental para la planificación de cualquier acción encaminada tanto a la exploración e investigación de sus recursos, como a otros fines: estudios de impacto ambiental y detección de riesgos geológicos, proyectos de ingeniería civil, y ordenación y gestión del territorio. El objetivo de este Atlas es la creación por primera vez de una base cartográfica geológica digital de los márgenes continentales españoles compuesta de diversos mapas temáticos: 1) Mapa Geológico; 2) Mapa Geomorfológico; 3) Mapa de Edificios Volcánicos; 4) Mapa de Estructuras asociadas a Emisiones de Fluidos; 5) Mapa de Sedimentos del Fondo Marino; 6) Mapas de Recursos Minerales (Nódulos polimetálicos, Sulfuros polimetálicos, Placeres, Costras de hierro-manganeso ricas en cobalto, Evaporitas, Afloramientos de pegmatitas y mineralizaciones alojadas en sistemas filonianos y Fosforitas). Junto con estos mapas, que se presentan sobre un modelo de sombreado que permite visualizar el relieve del fondo marino, se proporcionan otros mapas auxiliares de interés como son el Mapa de Toponimia y el Mapa de Situación de Sondeos. Además estos mapas van acompañados de información adicional que incluye referencias y otros datos sobre los rasgos geológicos cartografiados. El área geográfica cubierta comprende los márgenes continentales atlántico (Golfo de Vizcaya, Galicia y Golfo de Cádiz) y mediterráneo y las Islas Canarias, así como las llanuras abisales adyacentes. Desde el punto de vista de la Convención de Derecho del Mar de Naciones Unidas (ONU), este Atlas incluye la Zona Económica Exclusiva y las zonas de plataforma continental ampliada solicitadas ante la Comisión de Límites de la Plataforma Continental de la ONU. Los mapas ilustran el estado de la información geológica y están preparados para su consulta y uso con Sistemas de Información Geográfica, facilitando así la visualización y el análisis conjunto de los diversos niveles de información. Además, se incluyen imágenes de los mapas (formato jpg) a escala 1:500.000, con su leyenda correspondiente.

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Evolución paleoambiental de la Depresión de La Janda (Cádiz, España) durante los últimos 26.000 años

Rosa Mediavilla[1*], Juan I. Santisteban[2], Cristina Val-Peón[3], Klaus Reicherter[3], Margret Mathes-Schmidt[3], Luis A. Galán de Frutos[1], Begoña del Moral[1], José A. López-Sáez[4]

[1*] Instituto Geológico y Minero de España, CSIC, C/Ríos Rosas 23, 28003 Madrid, España, r.mediavilla@igme.es
[2] Departmento de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, 28040 Madrid, España.
[3] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstraße 4-20, 52060 Aachen, Alemania.
[4] Centro de Ciencias Humanas y Sociales, CSIC, C/Albasanz 26-28. 28037 Madrid, España.

Palabras clave: *Pleistoceno-Holoceno, lagoon, fluvial, nivel del mar, actividad humana.*

La Depresión de La Janda se sitúa en el extremo occidental de la Cordillera Bética, al Sur de la Península Ibérica (Vejer de la Frontera, Cádiz). Es una depresión de origen tectónico, emplazada sobre el Flysch del Campo de Gibraltar, rellena por sedimentos continentales y marinos del Pleistoceno y Holoceno. Se interpreta la evolución sedimentaria de la depresión utilizando la información obtenida del estudio estratigráfico, sedimentológico, geoquímico, paleontológico y cronológico de doce sondeos. Durante el Pleistoceno superior (ca. 27.000 años cal BP) esta depresión estaba ocupada por sistemas fluviales de gravas que drenaban al Atlántico a través de un angosto valle, el cual debió ocupar una posición similar a la salida del actual río Barbate. Un nuevo valle fluvial fue excavado durante la caída eustática del Último Máximo Glacial (ca. 18 ka); la morfología de este valle quedó condicionada por la convergencia de los precursores de los ríos Barbate, Almodóvar y Celemín en una fosa tectónica con conexión restringida con el océano. El desarrollo de un paleosuelo hidromorfo cubierto directamente por depósitos de transición indica la rapidez de la inundación de la depresión por el mar, que puede ser datada como anterior a los 12.000 años cal BP. Ese rápido ascenso propició la entrada de aguas oceánicas, pasando de unas condiciones salobres a marinas, cuyo máximo se puede situar en torno a unos 6500 años cal BP, cuando se alcanzó la máxima inundación de la cuenca. A partir de este momento, la tasa de ascenso eustático cayó notablemente y se produjo el cambio progresivo de un patrón agradante a otro generado por la progradación de los ambientes de transición y fluviales, con lagunas efímeras en sus llanuras de inundación. Esto provocó la colmatación y continentalización de la depresión. Es interesante destacar que se registra un aumento en las tasas de sedimentación a partir de ca. 1500 años cal BP que se puede relacionar con un incremento de la actividad antrópica.

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Launching project RECAP - REduce atmospheric Carbon by Alkalinity enhancement in intertidal environments: Potential and impacts

Isabel Mendes[1*], Alexandra Cravo[1], Joachim Schönfeld[2], Óscar Ferreira[1], A. Rita Carrasco[1], Patricia Grasse[3], Ana Gomes[4], Cátia Correia[1], Julia Lübbers[1]

[1*] Centro de Investigação Marinha e Ambiental (CIMA) – Universidade do Algarve, Portugal, imendes@ualg.pt

[2] Helmoltz Centre for Ocean Research Kiel (GEOMAR), Germany.

[3] German Centre for Integrative Biodiversity Research Halle-Jena-Leipzig (iDiv), Germany.

[4] Centro Interdisciplinar de Arqueologia e Evolução do Comportamento Humano (ICArEHB) – Universidade do Algarve, Portugal.

***Key words**: Climate action, Carbon dioxide removal, alkaline minerals, field experiment, Ria Formosa.*

Project RECAP intends to assess the potential benefits and risks associated with increasing alkalinity in intertidal environments, to remove carbon dioxide (CO_2) from the atmosphere to mitigate climate changes and associated environmental changes. The natural processes of weathering on land and the associated increase in ocean alkalinity already removes CO_2 from the atmosphere on geological time scales. This can be enhanced by adding small grains of alkaline minerals to coastal areas, to mitigate climate change on short timescales. However, the rate of CO_2 removal depends on the type of minerals used, grain sizes, and other abiotic parameters. Testing CO_2 removal by increasing alkalinity has mostly been performed by modelling and laboratory studies, and thus field experiments under natural conditions are urgently required.

The RECAP project wants to reduce this gap by gaining strategic knowledge on the potential benefits and risks associated with alkalinity enhancement in intertidal environments. That will be achieved by implementing a novel in-situ experiment, continually monitored for 2 years, in the Ria Formosa coastal lagoon, southern Portugal. Minerals rich in olivine and basalt, with different grain-sizes, will be deposited in a set-up with different treatments, in replicates. Monthly, water samples (supernatant and interstitial) will be collected and analysed for: temperature, salinity, oxygen, pH, total alkalinity, trace metals and nutrients. Quarterly, surface sediment samples will be collected and analysed for biodiversity composition including macrofauna, meiofauna, microfauna (benthic foraminifera), diatoms and bacteria. The obtained results will allow to evaluate the potential of alkalinity enhancement, the associated biogeochemical changes as well as the ecological impacts in the intertidal environment of Ria Formosa coastal lagoon.

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Living and dead benthic foraminifera from the submarine prodelta off the Guadalfeo River, northern Alboran Sea

Isabel Mendes[1*], Liliana Guerra[1], Patricia Bárcenas[2], Javier Cerrillo[3], Angel Puga-Bernabéu[4], Anxo Mena[5], Francisco J. Lobo[3]

[1*] Centro de Investigação Marinha e Ambiental, Universidade do Algarve, Faro, Portugal, imendes@ualg.pt
[2] Instituto Español de Oceanografía, Fuengirola, España.
[3] Instituto Andaluz de Ciencias de la Tierra, Armilla, España.
[4] Universidad de Granada, Granada, España.
[5] Universidade de Vigo, Vigo, España.

Key words: *Environmental indicators, Foraminiferal assemblages, surface sediments, Mediterranean Sea.*

The Guadalfeo River submarine prodelta is located on the northern margin of the Alboran Sea. This area receives the discharges of one of the major regional rivers with a permanent flow, is fed by a steep drainage basin with a wide range of sediment sizes, leading to a deltaic deposit mainly built up from the fluvial sediment supply during intense rainfall events. Benthic foraminiferal assemblages are ecological indicators widely used for environmental assessments and paleoenvironmental reconstructions, diverse faunas have been described in large and small Mediterranean deltaic systems.

This work aims to study the abundance and distribution of living and dead benthic foraminiferal assemblages, on the submarine deltaic system of the Guadalfeo River, in order to understand the influence of river discharges on the spatial and temporal distributions of benthic communities.

Within the scope of ALSSOMAR project, surficial sediment samples were acquired during an oceanographic survey conducted onboard the RV Sarmiento de Gamboa, on September 2019. Samples were collected with a box corer, from five stations, three on the Guadalfeo River prodelta, one site in the nearby shelf break and one site from the Motril Canyon head. The uppermost 3 cm of surface sediments were sampled into 1-cm slices and stained with Rose Bengal, for benthic foraminiferal analyses. Sediment samples for grain-size and organic content analyses were also obtained.

Results showed that the samples were mainly composed of sand and silt, with low values of clay and gravel; it was also found that carbonate percentages were more variable than organic matter percentages. The most abundant benthic foraminiferal species of living (45 species) and dead (63 species) assemblages, are in descending order *Bolivina ordinaria*, *Brizalina dilatata* and *Eubuliminella exilis*. These species are considered to be highly opportunistic taxa with infaunal micro-habitat preferences, which have some ability to tolerate oxygen depletion and occupy specific niches with high environmental stress.

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Modeling erosional mitigation solutions in sandy coasts: intervention scenarios in Barra-Vagueira, Portugal

Blanca Mendiguren[1*], Carlos Coelho[1], Margarida Ferreira[1], Rita Pombo[1], Pedro Narra[2], André Cardoso[2]

[1*] RISCO and Department of Civil Engineering, University of Aveiro, 3810-193, Portugal, blancamg@ua.pt
[2] R5m Marine Solutions, 3800-164, Aveiro, Portugal.

***Key words**: Numerical modeling, coastal structures, shoreline evolution, erosion rates, future projections.*

Sandy coasts are currently under erosional threat in many locations around the globe and, the Portuguese coastline is no exception. The coastal stretch between Barra and Vagueira, located in the Aveiro region - northwest of mainland Portugal, covers a length of 11km. Throughout the past decades, a retreat on its coastline position has been observed, mainly due to a scarcity of sediments. Therefore, the aim of this study is to discuss different erosional mitigation scenarios, in a time-frame of 20 years, by applying the Long-Term Configuration (LTC) numerical model. The LTC allows to project the coastline position in sandy coastal areas subjected to different interventions, such as the construction, modification and/or removal of fixed structures, as well as sand nourishments, which are considered a more nature-based solution.

The study area was divided in three sectors in order to better detail and evaluate the coastline evolution: Barra, Costa Nova and Vagueira. The model calibration relied on average shoreline rate-of-change, evaluated considering cross-shore transepts every 250 m of shoreline position displacements from digital aerial photographs and orthophotomaps of 1958 and 2010, considering wave climate data produced in WAVEWATCH-III spectral model for a similar period as the forcing agent.

For the 20-year shoreline projections, the wave climate dataset considered the RCP4.5 scenario projection by the *Intergovernmental Panel on Climate Change* (IPCC) and a mean sea level rise of 0.0075 m/year. Six typology scenarios were defined consisting of 1 reference scenario, assuming the maintenance of the existing structures without any additional intervention and 5 erosion mitigation scenarios, based on fixed structures interventions and nature-based solutions: i) construction of a new groin; ii) construction of a sea-wall; iii) extension of an existing groin; iv) execution of artificial nourishments and; v) removal of two existing groins combined with artificial nourishments.

Results highlight the importance of the location and dimension of interventions, where significant impact was observed in areas located beyond the implementation site. The projection of the coastline position along time allows to estimate, compare and discuss the benefits of each intervention scenario, which further demands the valuation of the land use and ecosystem services.

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Modelling and mapping sedimentary habitats in the Avilés Canyon System, Cantabrian Sea

Larissa Modica[1]*, Cristina Rodriguez-Cabello[1], Augusto Rodríguez-Basalo[1], Pilar Ríos[2], Javier Cristobo[2], Alberto Abad[1], Elena Prado[1], Francisco Sánchez[1]

[1] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain, larissa.modica@ieo.csic.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Gijón (IEO-CSIC), Spain.

Key words: *benthic communities, distribution models, Site of Community Importance, deep-sea, biodiversity.*

Sedimentary habitats and their benthic communities in the Aviles Canyon System (ACS), Central Cantabrian Sea (Bay of Biscay) were described. Submarine canyons are known to be biodiversity hotspots, and ACS was declared Site of Community Importance (SCI) because it harbors habitats listed in Habitat Directive 92/43/EEC. Assemblage presences (60 hauls obtained by trawl surveys) have been used as input for applying habitat suitability predictions. We considered presences all the hauls belonging to a certain assemblages while absences were generated using the positions of the hauls belonging to other assemblages. Assemble first, predict later and true absence methods were applied. Random Forest (RF) models have been trained and tested in order to obtain habitats suitability map, calculate their extension and to understand communities response to environmental factors conditioning their spatial distribution. Six habitats were identified. Two on the continental shelf: Circalitoral Coarse Sand with *Gracilechinus acutus*, Circalittoral Fine Sand with *Munida sarsi*. One in the marginal shelf: Bathyal Fine Sands with *Ophiura ophiura*. One in the upper slope: Bathyal Fine Sands with *Actinauge richardi*. Two in the middle slope (upper and lower part): Bathyal Very Fine Sands with soft bodied echinoids, and the deepest distributed Bathyal Muds with *Pheronema carpenteri*. RF models gave AUC values between 0.72 and 1, variance explained by the models varied between 58.4% and 98.2%. Synergies between the explanatory variables were observed and their influence on the response variables was discussed. Factors that influence habitats suitability vary in the six assemblages, but depth is practically constant in determining suitability together with sediment type, content of organic matter in sediments and Bathymetric position index at broad scale.
Total estimated suitable surface was about 3637 km^2, covering 68% of the marine SCI, being the most extended the circalittoral ones. Habitats identified cover a bathymetric range between 100 and 1500 m. The deeper observed is that of bathyal muds with *P. carpenteri,* the hexactinellid nest sponge which forms 3-dimensional vulnerable structures used as micro-habitats by other species. The habitats identified will be useful for the management plan of the SCI when it is declared Special Area of Conservation (SAC).

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Geological sites of scientific value in the Iberian Atlantic Margin

Manu Monge Ganuzas[1*], Paulo Pereira[2], José Brilha[2]

[1*]Geological Heritage Commission of the Spanish Geological Society. Madariaga Dorretxea San Bartolomé auzoa 34-36, 48350 Busturia, Spain, manu-monge@euskadi.eus

[2] Institute of Earth Sciences, Pole of the University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

Key words: *geological heritage, coastal areas, climate change, Spain, Portugal.*

The inventory of geological sites is a fundamental asset to support the development of geoconservation actions in any territory. Geological sites are under different types of risks due to natural and human-made factors, but certainly that coastal sites are also highly susceptible to the direct influence of climate change and consequent sea-level variations. In addition, many coastal areas are also under pressure due to urban development related with the increase of population coming from rural areas. The aim of this work was to identify all geological sites with national and international scientific relevance located in the Atlantic Iberian Margin. We based the compilation of information on both site inventories of Spain and Portugal and on two qualitative criteria: geological sites exposed because of processes related with ongoing coastal dynamics or sites that might be affected by these processes on the short-medium term. Based on the available information and on these two criteria, we selected 255 sites from both inventories, 205 located in Spain and 50 in Portugal. These sites include not only those occurrences representing materials and processes of coastal dynamics but also sites associated with different geological frameworks and that are today exposed in coastal areas of the Iberian Peninsula.

It is expected that this work contributes to the definition and implementation by national, regional or local authorities of both countries of geoconservation strategies applied to coastal areas. This management is crucial to be considered in land-use planning and nature conservation actions, under the scope of policies for the adaptation to climate change.

Microplastics alter the functioning of marine microbial communities

D. Montoya[1,2,3], L. Polimene[4], E. Rastelli[5], R. Casotti[6], V. Manna[6], A.C. Trano[6], C. Santinelli[7], M. Saggiomo[6], M. Sprovieri[8], C. SansoneC.[6], C. Corinaldesi[9], J.M. Montoya[3], C.. Brunet[6]

[1*] Basque Centre for Climate Change (BC3), Edificio Sede 1, Planta 1, Parque Científico UPV-EHU, Barrio Sarriena, Leioa, Spain, daniel.montoya@bc3research.org

[2] IKERBASQUE, Basque Foundation for Science, Bilbao, Spain

[3] Theoretical and Experimental Ecology Station, UMR 5321, CNRS, 09200 Moulis, Franc.e

[4] Plymouth Marine Laboratory, Prospect Place, Plymouth PL1 3DH, UK.

[5] Fano Marine Center, Stazione Zoologica "Anton Dohrn", Fano, Italy.

[6] Stazione Zoologica "Anton Dohrn", Villa Comunale, 80121 Naples, Italy.

[7] CNR IBF, Pisa, Italy.

[8] CNR, Palermo, Italy.

[9] Università Politecnica delle Marche, Ancona, Italy.

Key words: *Plastics, sea, heterotrophic prokaryotes, phytoplankton, ecosystem functioning*

The ubiquity, abundance and persistence of microplastics (MPS) make them a major environmental challenge. Despite their effects at sub-individual, individual or population levels are well documented, the implications of MPS on ecosystem functioning, especially regarding lower trophic levels, are still largely unknown. Here, we report results from an in-situ mesocosm experiment exploring the impact of MPS on the structure and functioning of the marine microbial system. We combined the experimental mesocosm results with a modelling approach to test the direct and indirect effects of MPS on marine productivity and identify essential mechanisms by which MPS affect marine ecosystems. Our results show MPS-induced effects in photosynthetic capacity that increase productivity in the ocean. Changes in marine productivity are driven by reductions in photo-inhibition and shifts in the composition of heterotrophic prokaryote community (HP), which ultimately alter HP-phytoplankton competition and NH_4 cycling in the water column. Despite size, shape and surface physicochemical properties of MPS do affect HP colonization, our results showed that the effects of MPS on photosynthetic capacity are rather universal across MPS types. This study experimentally demonstrates that MPS in the ocean affect HP and phytoplankton communities, influence marine productivity and, more generally, can strongly impact the functioning of ocean ecosystems.

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Contributo para o conhecimento da cobertura sedimentar marinha da Ilha da Madeira

Sandra Moreira*[1, 2], Aurora Rodrigues[1, 2], Joaquim Pombo[1], Anabela Oliveira[1, 2], João F. Duarte[1, 2]

[1*] Instituto Hidrográfico, Divisão de Geologia Marinha, Rua das Trinas 49, 1249-093 Lisboa, Portugal, sandra.moreira@hidrográfico.pt

[2] Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Edifício C1, 1749-016 Lisboa, Portugal.

***Palavras-chave**: plataforma insular, vertente insular, espectrometria de fluorescência de raios-X, difração de raios-X.*

No âmbito do Programa SEDMAR - *Mapeamento dos sedimentos marinhos*, do Instituto Hidrográfico, realizou-se em maio de 2017 uma campanha oceanográfica, a bordo do NRP Gago Coutinho, visando a colheita de amostras de sedimento superficial para caraterizar a cobertura sedimentar da margem insular da Madeira. Vinte e oito amostras colhidas ao longo de um perfil segmentado, entre a linha de costa NE da Ilha da Madeira e os 2000 m de profundidade, foram analisadas do ponto de vista textural, elementar e mineralógico.

Numa primeira abordagem, baseada na distribuição espacial dos parâmetros analisados, foram caraterizados os domínios geomorfológicos de plataforma e vertente insular. Ao longo da plataforma insular, que se desenvolve localmente até aos 125 m de profundidade, ocorre a deposição de sedimentos constituídos por mais de 70 % de partículas grosseiras, apresentando uma dimensão média entre a areia muito fina (3,5 ϕ) e fina (2,7 ϕ). O teor em $CaCO_3$ aumenta com o afastamento à linha de costa, mas nunca excede os 20 %. Por sua vez, os sedimentos que se depositam na vertente insular, entre os 125 e os 2000 m de profundidade, apresentam um conteúdo variável em partículas grosseiras (20 % - 86 %), que se reflete num diâmetro médio entre 6,5 ϕ (silte fino) e 1,8 ϕ (areia média), e em $CaCO_3$ (14 % - 48 %). Do ponto de vista composicional, os sedimentos de ambos os domínios geomorfológicos são predominantemente compostos por litoclastos, que por sua vez são maioritariamente constituídos por minerais silicatados (piroxena, plagioclase e olivina). Minerais de óxido de ferro surgem em todas as amostras analisadas, mas em pequena quantidade, enquanto que os minerais carbonatados (aragonite e calcite) só foram detetados junto ao bordo da plataforma e ao longo da vertente e podem constituir até cerca de um terço da amostra total. A análise elementar da componente não carbonatada dos sedimentos aponta para o facto de estes serem o produto da erosão de litologias aflorantes na Ilha da Madeira.

Um estudo mais detalhado dos parâmetros analisados, acompanhado pela identificação e caraterização das partículas litoclásticas e bioclásticas que constituem os sedimentos, poderá fornecer pistas sobre as condições de deposição vigentes, assim como estabelecer sectores morfo-sedimentares ao longo do perfil em estudo.

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Petroleum coke as a chronological marker: insights from tidal marsh sediments of the Sado estuary, SW Portugal

João Moreno[1*], Eduardo Leorri[2], Francisco Fatela[1,3], Mª Conceição Freitas[1,3], Filipa Moreno[4], José Mirão[5], Luís Dias[5], Manel Leira[5], Pere Masqué[7], Ana Russo[1], Ana Cunha[1], Miguel Inácio[1], William Blake[8]

[1*] Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal, jcmoreno@fc.ul.pt

[2] Department of Geological Sciences, East Carolina University, Greenville, NC, 27858-4353, USA.

[3] Departamento de Geologia, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal.

[4] Independent Researcher, Caminho da Portela, n.º 97, 4940-061 Bico PCR, Portugal.

[5] Laboratório HERCULES, IIFA, Universidade de Évora, Largo Marquês de Marialva, 8, 7000-809 Évora, Portugal.

[6] Departamento de Bioloxía, Universidade da Coruña, Campus da Zapateira, 15071 A Coruña, Spain.

[7] School of Science and Centre for Marine Ecosystems Research, Edith Cowan University, Joondalup, Western Australia 6027, Australia.

[8] School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth, Devon, PL4 8AA, UK.

***Key words**: emerging chronologies, anthropogenic time marker, airborne emissions, Setúbal,* ^{137}Cs.

Human activities have introduced a wide range of pollutants into the atmosphere and aquatic systems, which in many cases accumulate in the sediments. These contaminants, regardless of likely often-harmful effects (e.g., microplastics, PAHs), can help to understand the dynamics that led to their emergence and accumulation, with some already integrated to enhance the chronological framework of the sedimentary record. In this context, we examined the usefulness of petroleum coke (petcoke) – a carbon-rich solid material derived from crude oil refining – as a suitable anthropogenic chronological marker in recent sediments from the Sado estuary (Setúbal, SW Portugal). This coastal system has been under strong pressure from the activities of the port of Setúbal, recognized as a significant source of pollution. Airborne particle pollution included fugitive dust emissions from open-stored petcoke at dry bulk terminals, as demonstrated by the widespread occurrence of sand-sized petcoke (Ø > 63 µm) in seven sediment cores recovered, from 2005 to 2020, in the Sado salt marshes. Historical data on the use of petcoke in the area nearby the estuary indicate its first inflows into sediments around 1996, with peak counts in the first decade of the 21st century. Taken together, petcoke and ^{137}Cs signatures have provided variable accretion rates over the past *ca.* 60 years. The overall evidence found largely supports that: (i) petcoke in high marsh settings can be a reliable chronological marker in port/harbour estuaries handling this material; and (ii) its co-application with artificial radionuclides can refine age determinations, key for studies of estuarine (hydro)dynamics, sea-level change, and sustainable management of estuaries and coasts.

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MARIBNO amphibious project: Structure of the NorthWest IBerian MARgin: Role of the Inherited Tectonics in the Alpine extension and inversión

Alfonso Muñoz-Martín[1*, 2], José Luis Granja-Bruña[1], Miguel Ángel de la Fuente Oliver[1], María Druet Vélez[1, 3], Gerardo de Vicente[1, 2], Jorge Gallastegui Suárez[4], Adolfo Maestro[3]

[1*] Dept. Geodynamics Stratigraphy and Paleontology, Complutense University of Madrid, Spain, amunoz@ucm.es

[2] Instituto de Geociencias (IGEO-CSIC-UCM), C/ Dr. Severo Ochoa 7, 28040 Madrid, Spain.

[3] Instituto Geológico y Minero de España, C/ La Calera 1, 28760 Tres Cantos, Madrid, Spain.

[4] Facultad de Geología, Universidad de Oviedo, C/ Jesús Arias de Velasco s/n, 33005 Oviedo, Asturias, Spain.

Key words: *Cantabrian margin, Bay of Biscay, inherited structure, tectonic inversion, crustal domain.*

The northwestern margin of the Iberian Peninsula was formed from former hyperextended continental margin, developed in the proximity to a RRR triple point, that underwent a subsequent partial tectonic inversion. This sector of the margin of Iberia presented a great deficit of geophysical and geological information. For these reasons the MARIBNO amphibious project is implemented (2019-2022) with a team leaded by the Complutense University of Madrid. The main objectives are focused on the study of the crustal structure, the tectonic control by the structure prior to the alpine stages and the mapping and characterization of the crustal domains, combining geological and geophysical criteria.

A one month-long geophysical cruise was carried out aboard the BO Sarmiento de Gamboa (Spanish Research Council-CSIC) in September-October of 2021. Data acquisition was divided in two cruise legs: The WAS Leg consisted in the acquisition wide-angle seismic data along 3 transects with simultaneous offshore-onshore recording in 3 component short-period instruments: Transect WAS-1 (320 km) recorded in 14 OBS and 11 land seismometers, Transect WAS-2 (260 km) recorded in 12 OBS and 10 land seismometers and Transect WAS-3 (255 km) recorded in 9 OBS and 12 land seismometers. The seismic source consisted in an airgun array with 4660 ci and 90 seconds of shot interval. The MCS leg consisted in the acquisition of 2D multichannel seismic reflection data (MCS) along 14 transects (1500 km) recorded on a digital streamer with a 12.5 m channel-interval. Several streamer configurations were deployed with 480, 240 and 168 channels and the seismic source consisted in an airgun array with 1960 ci. During both legs, continuous marine acquisition of multibeam bathymetry, gravity, geomagnetics and ultra-high resolution seismic data also were carried out. MARIBNO project is in process and the data are being processed and interpreted. Acquired information will be complemented and combined with the additional acquisition of onshore gravity and magnetic data and the information from several geological field mapping studies. Here we show some preliminary results.

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Nuevos datos gravimétricos y magnéticos marinos en el Margen Cantábrico occidental

Alfonso Muñoz-Martín[1*], José Luis Granja-Bruña[1], Miguel Ángel de la Fuente Oliver[1], Julián Fiz[2], M. Druet Vélez[3], Adolfo Maestro[3], Jorge Gallastegui[4]

[1*] Grupo de Tectonofísica Aplicada, Fac. CC Geológicas, Univ. Complutense, C/ José Antonio Novais 2, 28040 Madrid, España, amunoz@ucm.es

[2] Real Instituto y Observatorio de la Armada, Plaza de las Marinas s/n, 1100 San Fernando, Cádiz, España.

[3] Instituto Geológico y Minero de España, C/ La Calera 1, 28760 Tres Cantos, Madrid, España.

[4] Facultad de Geología, Universidad de Oviedo, C/ Jesús Arias de Velasco s/n, 33005 Oviedo, Asturias, España.

Palabras clave: *Gravimetría, Magnetismo, Margen Cantábrico.*

Desde el 14/09 al 17/10 de 2021 tuvo lugar la campaña geofísica marina del Proyecto anfibio MARIBNO a bordo del B/O Sarmiento de Gamboa. Se han adquirido datos geofísicos a lo largo de 5685 km. Los nuevos datos de campos potenciales (gravimetría y magnetismo) medidos a lo largo de varias secciones en la parte occidental del Margen Cantábrico (O de Asturias y Galicia) permitirán constreñir la estructura profunda y la naturaleza del basamento, completando la información sísmica adquirida durante la campaña. Se han adquirido datos gravimétricos a lo largo de 4180 km y datos geomagnéticos a lo largo de 1958 km con un intervalo de muestreo de 1 s. La instrumentación utilizada ha sido el Gravímetro Air&Sea Lacoste&Romberg y el magnetómetro Marine Magnetics SeaSpy. La calibración de los datos gravimétricos se ha realizado mediante un gravímetro Scintrex CG-5 entre el muelle pesquero y la base del IGN de la concatedral de Vigo, calculando las constantes de calibración al comienzo y final de campaña. La deriva instrumental del gravímetro durante más de un mes de navegación ha sido inferior a 5 mGal. Además, se han calibrado los datos del gravímetro con los adquiridos durante las campañas de la Zona Económica Exclusiva Española (ZEEE) a bordo del BIO Hespérides durante los años 2003, 2006, 2007, 2008, 2009, 2014 y 2015. Para el cálculo de las anomalías gravimétricas de Bouguer se ha utilizado la batimetría correspondiente al haz central de la sonda multihaz y para el cálculo de la corrección de fondo se ha utilizado la malla de batimetría multihaz procedente de las campañas de la ZEEE, con una resolución horizontal de 200 m, hasta una distancia de 22 km. La anomalía magnética se ha obtenido calculando la corrección del IGRF para las fechas y posición de cada medida, y para la variación diurna se ha utilizado el registro de la base geomagnética de San Pablo (IGN). El análisis preliminar de los datos muestra una gran variación de los perfiles de anomalías, que permiten inferir una variación lateral de la estructura del margen y de la zona de transición Océano – Continente (TOC).

Agradecimientos. Los autores agradecen a toda la dotación del B/O Sarmiento de Gamboa y al personal de la UTM su apoyo y gran profesionalidad. Este trabajo ha sido financiado por los proyectos MARIBNO (PGC2018-095999-B-I00) y CARESOILCM (S2018/EMT-4317).

Hacia una geoarqueología de los paisajes culturales marismeños: Procesos de reclamación, urbanización y restauración en los estuarios de la costa vasca

Josu Narbarte[1, 2*], Eneko Iriarte[3], Juan Antonio Quirós[2]

[1*] Sociedad de Ciencias Aranzadi, Departamento de Arqueología, jnarbarte@aranzadi.eus
[2] UPV/EHU, Grupo de Investigación en Patrimonio y Paisajes Culturales.
[3] Universidad de Burgos, Laboratorio de Evolución Humana.

Palabras clave: *pólder, arqueología, fuentes documentales, GIS, geoquímica.*

Los estuarios del margen ibérico atlántico se caracterizan por una alta densidad de las ocupaciones humanas situadas en su entorno, entre las que destacan regiones profusamente habitadas e industrializadas en el curso de los últimos dos siglos. Consecuentemente, este tipo de enclaves está siendo objeto de una creciente atención por parte de los investigadores, centrada fundamentalmente en caracterizar las interacciones entre procesos medioambientales y antrópicos y su reflejo en los registros sedimentarios. En especial, la restauración de los ecosistemas costeros en varios estuarios ha dado lugar a una reevaluación de su valor ecológico y a la necesidad de regenerar los antiguos enclaves industriales hoy en desuso.

Sin embargo, los procesos de apropiación y transformación de estos ecosistemas por parte de las comunidades ribereñas, hasta alcanzar su fisionomía definitiva a raíz de la Revolución Industrial, son todavía poco conocidos, ya que hasta la fecha no se han realizado investigaciones orientadas a documentar en profundidad la cronología, modalidad y consecuencias de la reclamación de marismas con fines agrarios y su posterior industrialización. La presente comunicación presenta los resultados preliminares del proyecto de investigación arqueológica *Erriberak*, realizado en 2021 en cuatro estuarios de la costa vasca (Urdaibai, Urola, Oria y Bidasoa) y orientado a documentar dichos procesos desde una perspectiva interdisciplinar a largo plazo (Edad Media-actualidad).

Los trabajos han combinado el estudio de fuentes documentales, cartográficas y orales con una prospección intensiva sobre el terreno y la realización de sondeos geoarqueológicos. Ello ha permitido restituir la morfología y evolución de los estuarios analizados desde la Edad Media hasta la primera mitad del siglo XX, identificando: 1) los actores sociales involucrados en los procesos de reclamación, los intereses en juego y los conflictos suscitados; 2) las prácticas concretas de transformación del medio estuarino, su reflejo material y su impacto en los registros sedimentarios; y 3) la relevancia de dichos procesos para la posterior industrialización/urbanización de determinadas zonas, así como los condicionantes que todo ello implica para la restauración de ecosistemas marismeños. Así, se propone como conclusión la necesidad de considerar estos procesos históricos como un elemento clave para la planificación y ordenación de este tipo de entornos.

Agradecimientos. El trabajo presentado en esta comunicación ha sido financiado por el Departamento de Cultura del Gobierno Vasco, dentro del programa de subvenciones a la investigación del Patrimonio Cultural Vasco. Josu Narbarte es beneficiario de una ayuda Margarita Salas a la contratación de personal investigador en la UPV/EHU.

High resolution magnetic surveys reveal sources and bodies of the Central Atlantic Magmatic Province and Cretaceous Alkaline Province off West Portugal

Marta Neres[1*, 2], Pedro Terrinha[1, 2], João Noiva[1, 3], Pedro Brito[1, 2], Carlos Ribeiro[3, 4]

[1*] Instituto Português do Mar e da Atmosfera, IPMA, I. P., Lisbon, Portugal, luis.batista@ipma.pt
[2] Instituto Dom Luiz IDL, University of Lisbon, Portugal.
[3] Universidade de Évora, Departamento de Geociências.
[4] Instituto de Ciências da Terra, ICT.

Key words: *Central Atlantic Magmatic Province, West Iberia Cretaceous Alkaline Province.*

West Portugal has onshore extensive outcrops of the Central Atlantic Magmatic Province (CAMP) and of the West Iberia Cretaceous Alkaline Province (CAP). The CAMP is well recognized onshore as probably the largest Large Igneous Province (LIP) on Earth, extending from Central South America to the north of France. The CAMP has been dated of uppermost Triassic age (~201 Ma) and did not last for more than 0.6 My, possibly. The amount of extruded or near surface magma is small when compared with other LIPs and the plutonic sources are not exposed. The West Iberia CAP extends from the 1000 km long Madeira-Tore Rise to the Portuguese onshore (~600 km in width) and spans from ~100 Ma to 65 Ma. Marine data from these two magmatic provinces are scarce with the exception of the CAP volcanic seamounts.

We present results from the compilation of a series of marine magnetic surveys conducted along the Portuguese nearshore from 2014 to 2019. Magnetic data were acquired with 1 nautic mile line separation, resulting in near full coverage of the nearshore along a 120 km long margin segment and extend a maximum of ~30 km offshore. For a large part of the surveyed area, ultra-high resolution seismics and multibeam bathymetry were simultaneously acquired and may help the interpretation.

We come up with important novelties, namely, (1) reveal the largest known to date Mesozoic intrusions of West Iberia, (2) detailed mapping of the Cabo Raso magnetic anomaly off Lisbon known since the 15th century (>1000 km^2), (3) intruded rift faults (4) the first known plutonic sources for the CAMP in Iberia and (5) the offshore continuation of the ~500 km long onshore Odemira-Ávila Triassic dyke.

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Controlo morfológico e de correntes litorais na distribuição de sedimentos na plataforma continental do Alentejo

João Noiva[1*], Marcos Rosa[1], Pedro Brito[1, 2], Marta Neres[1, 2], Pedro Terrinha[1, 2], Carlos Ribeiro[3, 4]

[1*] Instituto Português do Mar e da Atmosfera IPMA, I.P., Lisbon, Portugal, joao.noiva@ipma.pt
[2] Instituto Dom Luiz IDL, University of Lisbon, Portugal.
[3] Universidade de Évora, Departamento de Geociências.
[4] Instituto de Ciências da Terra, ICT.

***Palavras chave**: Plataforma do Alentejo, Batimetria multifeixe, retrodispersão acústica, sísmica de ultra-alta resolução.*

A plataforma continental do Alentejo foi investigada de modo sistemático entre 2017 e 2022 através de levantamentos de batimetria multifeixe e retrodispersão acústica do fundo marinho, sísmica de ultra-alta resolução e com magnetómetro, usando os navios Diplodus e Noruega do Instituto Português do Mar e da Atmosfera.

O objetivo principal destes levantamentos foi o de identificar corpos minerais (placers) de minerais metálicos de interesse estratégico.

A análise conjunta da batimetria multifeixe e da retrodispersão permitiu pela primeira vez identificar os elementos morfológicos de controlo da sedimentação detrítica Plio-Quaternária que na plataforma do Alentejo apresenta variações de alta frequência. Verificou-se que a distribuição de sedimentos móveis está fortemente condicionada pelo relevo subjacente herdado do Paleozóico, Mesozóico e Miocénico, assim como pelas correntes litorais em zonas de sombra da ondulação predominante de NW e depósitos gravíticos.

Identificaram-se campos de “sorted bed formations”, relevos em zonas de sombra de paleo-escarpas litorais associadas a variações eustáticas e às desembocaduras dos principais rios, Sado e Mira. Controlo de primeira ordem na distribuição sedimentar detrítica Quaternário é desempenhado pelo cabo Espichel e serra de Arrábida, cabo de Sines, canhão de Setúbal, vale submarino do rio Mira, e escarpa de falha do sistema da falha da Messejana.

Os depósitos transgressivos encontram-se particularmente bem preservados junto das paleoescarpas litorais, mostrando evidências de vários ciclos eustáticos.

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Estudio cicloestratigráfico y bioestratigráfico de la transición Eoceno medio/superior en el margen continental noribérico (Formación margas de Pamplona, Pirineo occidental)

Unai Olabarrieta[1*], Aitor Payros[1], Jaume Dinarès-Turell[2], Gilen Bernaola[3]

[1*] Departamento de Geología, Facultad de Ciencia y Tecnología, Universidad del País Vasco/Euskal Herriko Unibertsitatea (UPV/EHU), Sarriena s/n, 48940, Leioa, España, unai.olabarrieta@ehu.eus

[2] Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, 00143 Roma, Italia.

[3] Departamento de Ingeniería Minera y Metalúrgica y Ciencia de los Materiales, Escuela de Ingeniería de Bilbao, Plaza Ingeniero Torres Quevedo 1, 48013 Bilbao, España.

Palabras clave: *Bartoniense, Priaboniense, Milankovitch, nanofósiles, susceptibilidad magnética.*

Durante el Eoceno el margen continental septentrional de la península ibérica estuvo localizado en una paleolatitud de 30-35ºN, especialmente sensible a cambios climáticos. En esta zona se acumularon potentes sucesiones sedimentarias de carácter marino profundo que están ahora expuestas en afloramientos accesibles de las cuencas Surpireniaca y Vasco-Cantábrica. En este trabajo se presentan los resultados obtenidos del estudio cicloestratigráfico y bioestratigráfico de uno de estos afloramientos, compuesto por materiales de la Formación margas de Pamplona, ubicado en la zona del embalse de Yesa (provincia de Zaragoza). En esta zona la Formación margas de Pamplona está caracterizada por una llamativa alternancia de capas de margas y margocalizas hemipelágicas de espesores métricos. Se han levantado varias columnas estratigráficas parciales de detalle (a escala centimétrica) en las zonas más apropiadas del afloramiento principal. La correlación capa a capa de dichas columnas parciales ha permitido su integración en una sección compuesta de 145 metros de espesor. Se han tomado muestras de todas las capas para la datación bioestratigráfica de la serie mediante nanofósiles calcáreos (según la escala de Agnini et al., 2014, Newsletters on Stratigraphy 47, 131-181), que han permitido identificar las biozonas CNE15 y 16 del Bartoniense (Eoceno medio) y la biozona CNE17 del Priaboniense (Eoceno superior). En la sección estudiada se han identificado 34 parejas de capas marga-margocaliza, que han sido muestreadas a intervalos decimétricos regulares para analizar la susceptibilidad magnética de las mismas. Los datos han sido procesados mediante el software libre Acycle para el análisis cicloestratigráfico del conjunto estratigráfico, lo cual ha permitido identificar ciclos de diferentes órdenes que demuestran que la sedimentación hemipelágica estuvo condicionada por cambios climáticos regulares de origen astronómico (ciclos de Milankovitch). La organización cicloestratigráfica de la sucesión estudiada, así como las implicaciones paleoclimáticas y bioestratigráficas correspondientes, han sido comparadas con las del estratotipo global del Priaboniense en Alano di Piave, Italia (Agnini et al., 2021, Episodes 44, 151-173).

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Unlocking the secrets held by pollen in the Shackleton Site on the Iberian Margin: A snapshot on key interglacials of the last 800,000 years

Dulce Oliveira[1, 2*], Stéphanie Desprat[3, 4], Filipa Naughton[1, 2], Teresa Rodrigues[1, 2], Qiuzhen Yin[5], Ricardo Trigo[6], Fátima Abrantes[1, 2], David Hodell[7], Maria Fernanda Sánchez Goñi[3, 4]

[1] CCMAR, Centro de Ciências do Mar, Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal, dulce_oliveiraa@hotmail.com
[2] Divisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera (IPMA), Av. Doutor Alfredo Magalhães Ramalho 6, 1495-165 Algés, Portugal.
[3] Ecole Pratique des Hautes Etudes (EPHE, PSL University), 33615 Pessac, France.
[4] Université Bordeaux, EPOC, UMR 5805, 33615 Pessac, France.
[5] Georges Lemaître Center for Earth and Climate Research, Earth and Life Institute, Université Catholique de Louvain, Louvain-la-Neuve, Belgium.
[6] Instituto Dom Luiz, Universidade de Lisboa, 1749-016 Lisboa, Portugal.
[7] Godwin Laboratory for Palaeoclimate Research, Department of Earth Sciences, University of Cambridge, Cambridge, UK.

Key words: *Interglacial climate, Mediterranean vegetation, Marine pollen analysis, Model-data comparison, Holocene analogues.*

The predicted global warming in response to anthropogenic climate change is accompanied by irreversible changes in the terrestrial ecosystems worldwide. Understanding past warm periods remains vital for developing reliable scenarios of future climate-driven change in the vulnerable vegetation of the Mediterranean region. Yet, due to the scarcity of paleovegetation records, important questions persist about interglacial intensity, duration, and regional expression during the Pleistocene. This study is based on high resolution pollen analyses that allow a direct comparison between pollen-based vegetation changes and sea surface temperature variability in the same sediment sample set from the International Ocean Discovery Program (IODP) Site U1385, also known as the “Shackleton Site”. This site was collected on the SW Iberian margin, which is recognized as a prime location for tracking past vegetation and climate changes and, additionally, has been identified as one of the most responsive regions to global climatic changes. Revealing the processes behind the vegetation response to key interglacials such as the Marine Isotope Stage (MIS) 11 and MIS 31 provides insights on the nature, timing and causes of past climate changes under the distinct baseline climate states before and after ~1 million years, i.e. the 41,000 and 100,000-year cyclicity worlds, respectively. Moreover, the discussion of Site U1385 paleoclimate records in the light of modelling simulations allows determining the dominant forcings and feedback mechanisms explaining the regional expression, in terms of forest expansion and hydroclimate changes, of the best orbital analogues of the Holocene (i.e. MIS 19c and MIS 11c) and the lukewarm interglacial MIS 13.

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Depositional environmental classification based on entropy analysis: Application to bottom continental shelf sediments (Western and Southern Portugal)

Anabela T. Campos Oliveira[1*, 2], Rita Guerra Santos[1], Ana Isabel Santos[1]

[1*] Instituto Hidrográfico, Rua das Trinas 49, 1249-093 Lisboa, Portugal, anabela.oliveira@hidrografico.pt
[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal.

Key words: *statistic analysis, grain-size, sources, particles.*

Entropy analysis was applied to the grain size spectra of 196 bottom sediment samples collected under the scope of AQUIMAR and HABWAVE Projects and used to identify general depositional patterns. Bottom samples were collected in October 2018 and March 2019 using a Smith-McIntyre grab sampler. In both periods, the top 20 cm of collected samples were homogenized and grain-size was analysed using the combination of two techniques: sieving for the >500µm fraction, and laser forward-scattering (MALVERN 2000) for the <500 µm fraction.

Entropy analysis applied to the resulting grain size spectra, allowed to explain up to 75 % of grain-size variability, partitioning the bottom samples into 6 groups of distinct particle size curves: Group 1- polymodal curve, with the prevalence of the finer modal sizes (mode at 9 µm) with a coarse “tail” (mode at 595 µm); Group 2 - unimodal curve with modal size at 210 µm; Group 3 – polymodal curve, with a prevalence of fine sandy sediment with a clear mode at 105 µm and a well-marked finer “tail”; Group 4 – coarser sediments with a unimodal curve centred at 1189 µm; Group 5 – a distinctive curve with a principal mode at 595 µm and a smaller “tail” in the finer fractions (this principal mode is also present as secondary mode at groups 1, 3 and 6); Group 6 – polymodal curve with a principal mode at 297µm and a “tail” in the finer fractions. The presence of paleo-littorals deposits (relict sediments) were well represented in group 4; littoral modern sands correspond to groups 2 and 3 (modal size); the fine tails reflect the silty fraction that are presently transported by the rivers to the shelf environment and finally the 595 µm modal size corresponds to carbonated biogenic remains. The group’s distribution maps identify different shelf depositional environment, as well as particle sources and origins, separating areas were active transport and accumulation of sediments (both terrigenous and biogenic) are expected under the actual oceanographic regime, from areas where relict and palimpsest sediments dominate.

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Overview of nepheloid layer dynamics off the Portuguese continental margin

Anabela T. Campos Oliveira[1*, 2], Ana Isabel Santos[1], Rita Guerra Santos[1], Nuno Zacarias[1]

[1*] Instituto Hidrográfico, Rua das Trinas 49, 1249-093 Lisboa, Portugal, anabela.oliveira@hidrografico.pt
[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal.

Key words: *suspended particulate matter, physical processes, transport, sources, mineralogy.*

As part of projects AQUIMAR and HabWAVE, intensive CTD (conductivity, temperature and depth), and turbidity/ particulate matter concentration (PMC) data were collected in four cruises along the Portuguese continental shelf, over three consecutive years under contrasting seasonal scenarios. Two of the cruises were carried out during fall (5-26 October 2018 and 10 - 31 October 2019), one in spring (18 April to 12 May 2019), and another under winter conditions (24 February to 19 March 2020). Water samples were collected at the surface nepheloid layer (SNL) and bottom nepheloid layer (BNL) for evaluation PMC and particulate matter mineralogy (PMM). Differences found between the 5 sampled areas (Viana do Castelo-Porto; Aveiro-Figueira da Foz; Peniche-Santa Cruz; Setúbal-Sines; Sagres-Tavira), are well visible in T-S (temperature vs. salinity) diagrams based on CTD casts. PMC found in the study samples for all cruises was in the range of 0.1-10.2 g/m^3. Turbidity meter data, calibrated and converted into inferred PMC values, showed that the study areas are generally characterized by generally low values, with the exception of some sporadic maxima found during the winter, in northern areas (between the Minho River to the north and the Mondego Cape to the south).
The particulate matter sample composition, obtained via X-ray diffraction, identified illite>chlorite> kaolinite>calcite>quartz>feldspars as major minerals, with clay minerals dominating and taking up more than 83% of the total identified mineral content. This analysis revealed that, for the fall and spring cruises, particles in the SNL were mainly biogenic, and for the BNL, the lithogenic material (average mica content of 71%) and biogenic calcite (average content of 10%) are dominant in all cruises. Cruise data also indicate that upwelling and internal waves affect and promote a higher level of turbulence in the water column, resulting in overall slightly higher turbidity values, found in the SNL and BNL.

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La Playa de Ostende (Castro Urdiales, Cantabria): un laboratorio natural para el estudio de procesos geológicos

Ana Pascual[1*], Javier Elorza[1], Blanca Martínez-García[2]

[1*] Departamento de Geología, Universidad del País Vasco (UPV/EHU), B. Sarriena, 48940 Leioa, Bizkaia, ana.pascual@ehu.eus

[2] Instituto Geológico y Minero de España (IGME-CSIC), C/ Ríos Rosas 23, 28003, Madrid.

Palabras clave: *dinámica costera, acuafactos, regeneración de playas, colonización, microfauna bentónica.*

La playa artificial de Ostende fue construida entre los años 1988 y 1991 mediante un aporte de 330.580 m^3 de grava sobre la Ensenada natural de Urdiales, que estaba constituida por pequeñas calas y una marisma. Este relleno provocó la destrucción de los ecosistemas bentónicos. A lo largo de los últimos 30 años esta playa ha servido de laboratorio natural para observar: i) la evolución y cambios en el sedimento debido al retrabajamiento de la grava producido por mareas y temporales; ii) las formas de abrasión mecánica generadas por dicha grava al chocar contra las calizas del Cretácico (Albiense Inferior), buzantes hacia el mar, que afloran en la playa; iii) el tiempo de recolonización del nuevo substrato por parte de la microfauna bentónica (foraminíferos y ostrácodos). En la actualidad, el sedimento de la playa de Ostende está compuesto de arena y grava-gravilla. La arena es similar a la de las playas del Sur del Golfo de Vizcaya y se asienta especialmente al oeste de la playa. La grava se encuentra en la zona supramareal y por debajo de una capa de arena, de unos 10 cm, en el intermareal. La mezcla de arena y grava ocasiona la formación de canales de retorno o marcas de surcos (*rill marks*). La abrasión mecánica del sedimento sobre las calizas del substrato de la playa ha generado acuafactos marinos, destruyendo parcialmente los alveolos, producto de la bioerosión de organismos marinos, existentes previamente al vertido. Esta abrasión es intensa (1 mm/año) y los acuafactos formados presentan morfologías tipo cucharas (*scoops*), vieiras (*scallops*) y quillas (*keels*). En cuanto a la recuperación de los ecosistemas bentónicos, los foraminíferos y ostrácodos han tardado entre 25 y 30 años en colonizar la playa de Ostende. Las especies más abundantes *Lobatula lobatula*, *Cibicides refulgens* (foramíniferos) y *Aurila convexa* (ostrácodo) representan una asociación típica de áreas costeras y de plataforma, apareciendo en mayor número sobre la arena, como en otras playas naturales atlánticas. Todos estos datos ponen de relieve la transformación de la playa artificial de Ostende en una playa consolidada de tipo “bolsillo (*pocket beach*).

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Astronomical forcing on an Albian carbonate ramp from the Basque-Cantabrian basin

Aitor Payros[1*], Naroa Martínez-Braceras[1], Luis M. Agirrezabala[1], Jaume Dinarès-Turell[2]

[1*] Department of Geology, Faculty of Science and Technology, University of the Basque Country (UPV/EHU), P.O. Box 644, E48080 Bilbao, a.payros@ehu.eus

[2] Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, I00142 Roma, Italia

Key words: *Cretaceous, hemipelagic, climate, cyclostratigraphy, Milankovitch.*

Our understanding of the stratigraphic expression of astronomically driven climate change cycles in the Milankovitch frequency band has improved significantly in recent decades. However, several aspects have been little studied to date, such as the nature of the climatically regulated environmental processes that ultimately control cyclic sedimentation. Similarly, relatively little is known about the expression of Milankovitch cycles in successions accumulated in tectonically active basins. In order to fill this knowledge gap, the Albian hemipelagic deposits of the Mioño Formation exposed in Castro Urdiales (Basque-Cantabrian basin) are studied herein. These deposits were accumulated during a rifting phase with strong tectonic activity. The sedimentological, petrographic and cyclostratigraphic analysis demonstrates that, despite the synsedimentary tectonic instabilities and some diagenetic overprinting, the hemipelagic carbonate alternation was astronomically forced 110.68-110.47 Ma. Seasonality fluctuations driven by precession cycles caused periodic (20 ky) variations in the rate of carbonate productivity (abundance of pelagic calcareous plankton and micrite exported from adjacent shallow-water platforms) and/or siliceous dilution (terrestrially derived siliciclastic sediment supply and siliceous particle production by sponges). These variations resulted in the formation of marly limestone beds when annual seasonality was low (i.e., boreal summer at aphelion, winter at perihelion) and the accumulation of marlstones when seasonality increased (i.e., boreal summer at perihelion, winter at aphelion). The incidence of these processes increased and decreased in line with seasonality modulation by short eccentricity cycles of 100 ky. In conclusion, this study shows that Milankovitch cycles can be reliably recorded in hemipelagic successions accumulated in tectonically active settings.

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OSPAR indicators integration to assess the benthic habitats' environmental status in response to the trawling effort

Maider Plaza-Morlote[1*], Ana García-Alegre[1], Alberto Serrano[1], Antonio Punzón[1], José Manuel González- Irusta[1]

[1*] Instituto Español de Oceanografía (CNIEO-CSIC), Centro Oceanográfico de Santander, Promontorio San Martín s/n, 39080 Santander, Spain, maider.plaza@ieo.es

Key words: *BH1 and BH3 common indicators, trawling disturbance, pressure-state curves, Marine strategy framework directive, ecological quality thresholds.*

Indicators are key tools to achieve good environmental status for benthic/marine ecosystems and manage anthropogenic activities under the EU Marine Strategy Framework Directive (MSFD). However, the lack of coherence between different indicators assessments at the EU member states' level could be a barrier to the implementation of the Directive. To address this issue, OSPAR has developed inter-comparable regionally harmonised approaches to monitor and assess the bottom integrity by developing five indicators. Here, the integration of two of them, the BH1 and BH3, is proposed to assess the state of benthic habitats in response to bottom trawling. The BH1 indicator measures the proportion of sentinel species within each MSFD broad habitat as a proxy to its environmental status. It requires detailed monitoring data across the pressure gradient of each habitat assessed to determine the environmental status based on the pressure-state curves. This need for quality data reduces uncertainty but creates gaps in the assessment. The BH3 indicator establishes the overall impact on each habitat based on a theoretical matrix of disturbance. It allows the evaluation of large marine areas where only limited data is currently available by extrapolating data and knowledge from local studies. Therefore, the evaluations of BH3 see their uncertainty increased concerning BH1 but cover the gaps. We propose complementary evaluations based on the BH3-BH1 tandem to reduce uncertainties and spatial gaps. Specifically, this study uses the BH1 pressure-state curves to evaluate the fishing pressure scale and the matrix underpinning disturbance categories to provide evidence of the BH3 pressure-state relationships in OSPAR Region IV. In this way, regional data derived from the BH1 indicator are used to inform the BH3, providing a solid basis for assumptions underpinning the BH3 method. Although the method proposed here uses the BH1, other indicators (such as BH2b, another OSPAR Indicator to determine the status of benthic habitats based on the Margalef diversity) could be used similarly to provide a broader range of evidence.

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Contrasting effects of fishing and warming on functional traits configuration of Mediterranean and Atlantic demersal communities

Julia Polo Sainz[1*], Marta Sainz-Bariain[1], Laurenne Pecuchet[2], Manuel Hidalgo[3], Antonio Punzón[1], Encarnación García[4], Miguel Vivas[4], Antonio Esteban[4], José Manuel González-Irusta[1], Marina Sanz-Martín[3], Luis Gil de Sola[5], Augusto Rodriguez[1], Lucía López-López[1]

[1*] Centro Oceanográfico de Santander, CN-IEO-CSIC, Spain, julia.polo@ieo.es
[2] Norwegian College of Fishery Science, UiT, The Arctic University of Norway, Tromsø, Norway.
[3] Centro Oceanográfico de Baleares, CN-IEO-CSIC, Spain.
[4] Centro Oceanográfico de Murcia, CN-IEO-CSIC, Spain.
[5] Centro Oceanográfico de Málaga, CN-IEO-CSIC, Spain.

Key words: *marine communities, life history traits, climate change, effects of fishing, cumulative impacts.*

Many studies have focused on the functional response of marine communities to either fishing or climate change, but few have studied how both impacts combined can alter ecosystems. In this work, we studied the response of several community weighted functional traits to both sea warming and fishing pressure in the Atlantic and Mediterranean of the Iberian Peninsula and thus, assess their potential as indicators using field data.

Based on a literature review, we identified species life-history traits expected to condition their responses to climate change and fishing impacts for 250 species of Iberian demersal communities. These traits included longevity, body size, fecundity, offspring size, growth rate, trophic level, age at maturity and spawning period. We calculated the weighted mean traits of the community by weighting the species' trait value by the relative abundance of each of the species in the community, using long-term datasets of species abundances obtained during the ICES IBTS surveys in the North-Atlantic Iberian Shelf (ATL_{IS}) and the GFCM IBTS surveys in the Mediterranean Iberian Shelf (MED_{IS}). The effect of global warming (CC) was estimated through Sea Surface Temperature, while the effect of fishing (FE) was calculated based on information retrieved from VMS data. We explored the effects using linear models and fitting an interaction term between CC and FE to assess any potential synergistic effects.

Generally, the selected traits responded to fishing effort and temperature, however, the interaction among these impacts was not so obvious. These responses differed between the MED_{IS} and the ATL_{IS}, not conforming to the expectations we had based on the literature. For example, while CC and FE have been commonly proved to decrease community longevity and body size, we found that these two traits increased along temperature in the ATL_{IS}. Also trophic level, which is generally assumed to decrease under strong fishing pressures, increased with FE in the MED_{IS}. Our results suggest that the effect of these stressors on the ecosystem strongly depend on its previous ecological state, exploitation and recovery history, and plead for the development of sensitivity indices that incorporate this differential response of communities to the same stressors.

Sedimentary records of extreme events: using particle size and shape to link continental sources to shelf deposits

Joaquim Pombo*[1], Aurora Rodrigues[1], João Duarte[1], Anabela Oliveira[1]

[1*] Instituto Hidrográfico, Rua das Trinas 49, Lisboa, Portugal, joaquim.pombo@hidrografico.pt

***Key words**: Tagus submarine delta, high-energy events, grain size, particle shape.*

Tsunami backwash and offshore storm-surge sedimentary records are still poorly understood, probably due to the poor preservation conditions of their signatures, the impact of human activities in the nearshore area and the limited access to continental shelf sedimentary archives.

Nevertheless, it is widely recognised that the continental shelf offshore of the Tagus River estuary (Portugal), where high continental inputs of fine sediment occur, is a site with potential to investigate climate changes and look for imprints of high-energy events.

High-resolution geophysical proxies allowed to recognize an unusual sedimentary layer in this submarine delta off the Tagus River mouth (~50 m water depth). A 443 cm long core, collected in the muddy sector of this delta revealed a quite homogeneous sedimentation over time, composed by a sandy silt with clay-dominated sequence, disturbed at 62 cm below the surface, by a 97 cm thick clean gravelly sand layer with sharp limits and contrasting characteristics.

This study focuses fundamentally in the ability to use two proxies (grain size analysis and particle shape) in the identification of the source material for the sandy silt sediments that characterises the Tagus deposit and the intercalated gravelly sand layer, in particular.

For that, a Microtrac MRB Camsizer® P4 with dynamic image analysis capabilities allowed the detailed characterization of particle size and shape of the gravelly sand deposit, identify similarities with the Tagus estuarine sediments and exclude other coastal sources, namely, the nearby sandy beaches.

The gravelly sand deposit is characterized generally by angular and low sphericity (only 10% of the particles have a roundness and sphericity >0.8) medium sand. The deepest section (118 to 159 cm) present a mode of 1.75 ϕ; but in the middle section (112 to 118 cm) a coarser modal size (0.75 ϕ) was found with terrigenous particles presenting higher sphericity and roundness and sharp fragments of mollusks; the uppermost section (62 to 112 cm) is finer with a 1.25 ϕ mode.

Regionally, sediments similar to the gravelly sand deposit were found in coastal and fluvial deposits near the Bugio and close to Paço de Arcos.

Light minerals in coastal sediments of the Ártabro Gulf (NW Iberian Peninsula): identification, abundances, distribution and origin

Ricardo Prego[1*], Jaume Esteve[2], Santiago Giralt[3], Jordi Ibañez[3], Miguel Ángel Álvarez-Vázquez[4]

[1*] Instituto de Investigaciones Marinas (IIM), CSIC. 36208 Vigo, Spain, prego@iim.csic.es

[2] Faculty of Geology, University of de Barcelona, Barcelona, Spain.

[3] Geociences Barcelona (GEO3BCN), CSIC, Barcelona, Spain.

[4] GEAAT Research Group, Area of Physical Geography, Universidade de Vigo, Ourense, Spain.

Key words: *land-sea influence, major elements, continental shelf, Galicia.*

Several researches have been carried out in the Iberian Atlantic Margin in relation to the geochemical composition of the most surficial marine sediments. However, few studies tackled their mineralogical composition. The objectives of the present work are: to identify and quantify the light minerals that, due to pan effect, are concentrated; to assess their role as a source of major elements; to determine their distribution along the coast; and to associate them with the petrographic composition of land lithology. With that goals, nineteen surface sediment samples (20 cm thick) were collected (Van Veen grab) along the 30 m depth isobath from the R/V Lura between Capes Ortegal and San-Adrián (60 miles away; NW Spain). Major elements were determined by ICP-MS at the LabGEOTOP laboratory (GEO3BCN) while light minerals species were identified and quantified at the DRX laboratory (GEO3BCN).

Albite (2-15%) and microcline (2-10%) are present in all stations with a correlation coefficient r=0.54, together with quartz (5-44%) with an irregular distribution, and illite (16-56%) that is the most abundant of the light minerals. Chlorite (<14%) is ubiquitous except in San Andrés-Cedeira and Petón de Razo zones. Montmorillonite is only present (11-27%) at the two stations neighboring Cape Ortegal. There, lizardite is also abundant (15-20%), while in the other sediments contents remain below 4.7%. These seven light minerals have a terrigenous origin, coming from the weathering of the coastal and nearby reliefs. Calcite (7-44%), calcite-Mg (2-10%) and LOI (approx. carbonates and organic matter) come from biogenic processes; also, the heavy mineral pyrite (<8.6%) is occasionally present and its correlation with calcites (r=0.78-0.81) suggests a similar source. Abundance of major elements in sediments are: Al (0.5-5.0%), Ca (8-28%), K (0.3-2.0%), Fe (0.2-5.9%), Mg (0.1-9.3%), Mn (<0.13%), Na (0.5-1.5%), P (0.02-0.16) and Ti (0.02-0.54%). The aforementioned light minerals constitute the main source of major elements; their contents in the analysed sediments usually vary together with the light mineral abundances. It is noteworthy the correlations between Fe with montmorillonite (r=0.84), lizardite (0.85) and chlorite (0.51); Ca with calcites (0.78-0.80); Mg with lizardite (0.81) and montmorillonite (0.99); K with illite (0.46) and microcline (0.43).

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Effects of the demersal fisheries on benthic habitats diversity

A. Punzón[1*], A. Fernández-Arcaya[1], U. González-Irusta[1], J.M. Farriols[2], T. de la Torriente[1], A. Rodríguez-Basalo[1], A. Ceballos[1], E. Martín-Sosa[3], P. Massuti[1], E. Rueda[4], J.L. Sánchez[1], F. Serrano[1]

[1*] Centro Nacional Instituto Español de Oceanografía, CO Santander, 39004 Santander, antonio.punzon@ieo.csic.es

[2] Centro Nacional Instituto Español de Oceanografía, CO Baleares, 07015 Palma.

[3] Centro Nacional Instituto Español de Oceanografía, CO Canarias, 38180 Santa Cruz de Tenerife.

[4] Centro Nacional Instituto Español de Oceanografía, CO Málaga, 29640 Fuengirola.

Key words: *Avilés Canyon, biodiversity, impact, fisheries, benthic hábitats.*

The aim of the INTEMARES Project (Action 4.1) is to diagnose the impact of professional demersal fishing on benthic habitats RN2000. With the final task of providing sufficient scientific knowledge to advise on the implementation of management plans for the of Spanish MPAs network, and specifically for the Aviles Canyons System (ACS) in the Cantabrian Sea (Northern Spain).

The submarine canyons are highly productive areas that favor the development of very extensive and rich benthic habitats. These habitats produce important biomasses of fish that feed on benthos and associated fauna. This gives rise to the development of important demersal fisheries, mainly in the area of the head of the canyons. At the head of ACS there is an important concentration of demersal fishing activity using trawls (otter trawls and pair trawls), gillnets (targeting hake and monkfish) and longlines (mainly targeting hake).

Most of the scientific papers carried out to date has focused on the effects of trawling, which fishing mainly on sedimentary bottoms, but very few studies have been carried out on the effects of set longlining and gillnetting. In addition, these fishing activities can fishing on biogenic rocky habitats, and therefore more sensitive to human activities than the sedimentary. For this study, a survey has been carried out in the head of ACS (2018) where there is fishing activity with these three fishing activity. Have been sampling with photogrammetric sledge for the study of the impact of longline and gillnetting, and beam trawl for the study of the impact of trawling. The sampling was carried aout in stations with different degrees of fishing pressure. The spatial fishery data comes from the analysis of fishing activity from the VMS and logbook. the results will allow us to compare the effects on biodiversity (Shanon, N90, etc) of the three fishing gears.

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The importance of deep-sea scientific knowledge for nature conservation: The King's Trough case study

Teresa Rafael[1*], Inês Tojeira[1, 2], Luísa P. Ribeiro[1, 3], Mónica Albuquerque[1], Maria Simões[1], Luis Somoza[4], Teresa Medialdea[4], Francisco Javier González[4], Pedro Madureira[1,5]

[1] EMEPC, Portuguese Task Group for the Extension of the Continental Shelf, R. Costa Pinto 165, Paço de Arcos, Portugal, teresa.rafael@emepc.mm.gov.pt

[2] MARE, Marine and Environmental Sciences Centre, Faculty of Sciences, Lisbon University, Portugal.

[3] GeobioTec, Aveiro University, Portugal.

[4] Instituto Geológico y Minero de España (IGME), CSIC, Madrid, España.

[5] Dep. Geosciences and Institute of Earth Sciences, Évora University, Portugal.

Key words: *Antialtair Seamount, MPAs, extended continental shelf, Portugal, cold water corals.*

Marine Protected Areas (MPAs) have been at the centre of the nature conservation strategy to protect natural values, to restore natural habitats and to reverse natural heritage loss. With the nomination of an offshore MPA, the Rainbow Hydrothermal Field, in 2006, Portugal pioneered both to create a MPA located on the extended continental shelf and to join the international efforts to establish a network of MPAs, under OSPAR Convention. However, the total coverage protected area, under Portuguese jurisdiction, is far behind the international targets committed. Therefore, deep-sea research is essential for seabed ecosystems knowledge and consequently for future MPA identification. In this study, we present the first preliminary results on the natural biological and geological values of the King's Trough located NE of the Azores Archipelago, which is a NW-SE trending submarine depression formed by a long chain of basins and ridges and shouldered by seamounts, including the Antialtair seamount. Several locations in the King's Trough were visited in 2013 and 2019, during the deep-sea scientific cruises EMEPC/PEPC/LUSO/2013 and EXPLOSEA2 with Luso ROV (EMEPC). Five ROV dives were conducted, between 1630 and 2150 m depth, to collected samples and data – biological, geological, chemical and HD footage. The community structure is characterized by the cold water scleractinian corals *Desmophyllum pertusum* (Linnaeus, 1758) and *Madrepora* cf. *oculata* (Linnaeus, 1758) mixed with black corals (Antipatharia order) of dark orange colours, bamboo corals (*Keratoisis* sp.) and specimens of Primnoidea (cf. Candidella) covered with ophiuroids (Ophiuroidea). The deep-sea sponge fauna comprise incrusting specimens, glass sponges (Hexactinellida) and Demospongiae (Poecilosclerida order). These findings are important for the characterization of the environmental baseline and of the natural values present in the King's Trough macro-structure and are the first step in identifying and assessing its relevance for the definition of a new area of natural conservation.

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The Baelo Claudia tsunami deposits

Klaus Reicherter[1*], Pablo G. Silva Barroso[2], Ivan García-Jiménez[3], Fernando Prados Martínez[4]

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany, k.reicherter@nug.rwth-aachen.de

[2] Dpto. Geología, Universidad Salamanca, Escuela Politécnica Superior de Ávila, 05003 Ávila, Spain.

[3] Conjunto Arquelógico de Baelo Claudia (CABC), Agencia Andaluza de Instituciones Culturales, Ensenada de Bolonia, Tarifa, Cádiz, Spain.

[4] Instituto de Arqueología y Patrimonio Histórico (INAPH), Universidad de Alicante, Alicante, Spain.

Key words: *tsunami inundation, multi-proxy approach, sedimentology, natural hazards, geoarchaeology.*

Over the past decades, substantial progress has been made in tsunami research. However, little is still known about tsunami deposits and their related depositional mechanisms in coastal areas in historical and archaeological contexts. In particular, the Phoenician, Greek and Roman trade and military networks along the Mediterranean and Atlantic coasts, with their cities, harbours and additional facilities, are susceptible to serving as archives for extreme wave events. The Roman city of *Baelo Claudia*, located on the Bay of Bolonia Bay (southern Spain), offer a unique environment for studying historical tsunamis in the Gulf of Cadiz. Baelo Claudia suffered at least two earthquakes in Roman times, namely, in the first and fourth centuries CE. Only the latter, associated with a tsunami, led to the city's destruction and subsequent decline. Accordingly, three tsunami deposits in Baelo Claudia, dated to ca. 4000 cal yr BP (2000 BCE), ca. 400 CE and 1755 CE, the last corresponding to the Lisbon tsunami, are described herein, pointing to a recurrence period of ca. 2000 years for such catastrophic coastal events.

The multi-disciplinary research conducted on the sedimentary, archaeological and palaeontological records has revealed event deposits, together with major landscape changes in the environs of the bay after tsunami landfall. The city of *Baelo Claudia* has suffered inundation by approx. 8 m high waves, leaving a dark cohesive sand layer of ca. 25-50 cm thickness, containing fragments of pottery, fish and animal bones, glassware, bricks and tiles, as well as large fragments of masonry blocks and column drums. Furthermore, the significant archaeoseismic damage detected in recently excavated buildings has been dated to the end of the 4th century CE, e.g. by Roman coins. We interpret vast parts of the tsunami layer(s) as backwash deposits trapped with the destroyed buildings and streets of *Baelo Claudia* after earthquake. The results presented here serve to supplement the earthquake and tsunami record of coastal Iberia.

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Tasas de sedimentación recientes en estuarios y lagos del cantábrico

Juan Remondo[1*], Mario Morellón[2], Jaime Bonachea[1], José Gómez-Arozamena[3], Antonio Cendrero[1], Victoria Rivas[4], Víctor Villasante-Marcos[5], Luis M. Forte[6], José L. Cavallotto[6], Pablo Cruz[1], Manel Leira[7], Carlos Sierra-Fernández[8], Viola Bruschi[9], César Morales del Molino[10], Jon Gardoki[11], José E. Ortiz[12], Laura Rodríguez-Rodríguez[13], Francisco J. Ezquerra[14], Mario Puente[2], Antonio Barreda[1]

[1*] CITIMAC, Universidad de Cantabria. 39005 Santander, Cantabria, juan.remondo@unican.es
[2] Depto. de Geodinámica, Estratigrafía y Paleontología, Universidad Complutense de Madrid, 28040 Madrid.
[3] Depto. Ciencias Médicas y Quirúrgicas, Universidad de Cantabria, 39011 Santander, Cantabria.
[4] Depto. Geografía, Urbanismo y Ordenación Territorio, Universidad de Cantabria, 39005 Santander, Cantabria.
[5] Observatorio Geofísico Central, Instit. Geográfico Nacional, Real Observatorio de Madrid, 28014 Madrid.
[6] Instituto de Geomorfología y Suelos (IGS), Universidad Nacional de La Plata, La Plata (1900), Argentina.
[7] Departamento de Bioloxía, Universidade da Coruña, Campus da Zapateira, 15071 A Coruña.
[8] Depto. Tecnología Minera, Topografía y Estructuras, Universidad de León, Campus de Vegazana, 24071 León.
[9] Departamento Ciencia e Ing. del Terreno y Materiales, Universidad de Cantabria, 39005 Santander, Cantabria.
[10] Departmento de Ciencias de la Vida, Universidad de Alcalá de Henares, 28801 Alcalá de Henares, Madrid.
[11]Departamento de Geología, Facultad de Ciencia y Tecnología, Universidad del País Vasco, 48940 Leioa, Bizkaia.
[12] Departamento de Ingeniería Geológica y Minera, E.T.S.I., Universidad Politécnica de Madrid, 28003 Madrid.
[13] Departamento de Geología, Universidad de Oviedo, c/ Jesús Arias de Velasco s/n, 33005 Oviedo, Asturias.
[14] Junta de Castilla y León, C/ Rigoberto Cortejoso 14, 47014 Valladolid, Spain.

Palabras clave: *"Antropoceno", impacto antrópico sobre sedimentación, impulsores antrópicos y climáticos, evolución geoambiental, cambio global.*

Durante el último siglo, las tasas de sedimentación han experimentado un aumento casi generalizado a escala global, que se ha relacionado con la intensificación de la actividad humana y el cambio climático. La región cantábrica representa un buen lugar para abordar esta cuestión e identificar los principales impulsores del cambio global, puesto que ha experimentado una gran presión humana y se localiza en el límite de las regiones bioclimáticas Eurosiberiana y Mediterránea. Los estuarios tienden a tener cuencas hidrográficas más grandes y haber sufrido más impactos antrópicos que los lagos interiores, pero están influenciados por los cambios del nivel del mar que pueden constituir un factor determinante adicional en los procesos de sedimentación. En este trabajo se han analizado una veintena de cuencas de la cornisa cantábrica, la mitad corresponden a estuarios costeros y la otra mitad a pequeños lagos interiores. Se han integrado datos geomorfológicos, sedimentológicos, geoquímicos y geocronológicos. En particular, se han comparado las tasas de sedimentación recientes en relación con los impulsores naturales y humanos. Los resultados obtenidos, aunque muestran algunas diferencias explicables por factores locales, revelan una tendencia regional de aumento similar en los estuarios y los lagos, equivalente al de otras zonas del mundo.

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Latitudinal warming on Iberian Margin during Mid Pleistocene Transition

Teresa Rodrigues*[1, 2], Antje Voelker[1, 2], Joan O. Grimalt[3], Marta Casado[3], Yolanda Gonzalez[3], Fátima Abrantes[1, 2]

[1] Divisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera, Rua Alfredo Magalhães Ramalho 6,1495-006 Lisboa, Portugal, teresa.rodrigues@ipma.pt

[2] Centro de Ciências do Mar, Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.

[3] Department of Environmental Chemistry, Institute of Environmental Assessment and Water Research (IDÆA-CSIC), Barcelona, Spain.

Key words: *Sea Surface Temperature, Alkenone Index, Warmest Interglacial.*

Climate has changed significantly over the last few decades, affecting the environment and societies worldwide. The rise in air and ocean temperatures, widespread melting of snow and ice, and rising sea levels point to a shift in the Earth's climate system equilibrium. The Mediterranean climate region *sensu lato*, including SW Europe, has been highlighted by IPCC 2021 models as one of the most sensitive regions to the ongoing global climatic changes. Over the last two million years, the Earth's climate system underwent repeated long-term climatic shifts between glacial and interglacial (G/I) conditions. The timing, length, and amplitude of the major G/I cycles have been modulated by changes in the prevailing astronomical parameters linked to changes in the Earth's orbit around the sun. In particular, the Early Pleistocene symmetrical low-amplitude and high-frequency (41 ka obliquity-forced) climate cycles were gradually replaced by later Pleistocene asymmetrical high amplitude and low-frequency (100 ka eccentricity-forced) climate cycles. The transitional period between the 41 ka to the 100 ka cyclicities is known as the Mid Pleistocene Transition (MPT), though yet debatable, MPT was set between 1.2 and 0.7 Ma. Understanding this transition is particularly challenging because the Earth's astronomical configuration does not comply with the climate variability documented for the MPT. Internal processes such as ice volume, greenhouse gas concentration (GHG), ocean and atmospheric dynamics, and vegetation, have been invoked to explain the changes observed at the MPT. Here we present sea surface temperature (SST) based on the alkenone index and the major surface hydrological disruption in three sites from IODP exp. 339 on Southwest and South of Iberian margins, Sites U1385 (37°34.285′N, 10°7.562′W, 2582 m water depth (mwd)); U1391 (37°21.5′N; 9°24.6′W, 1085 mwd) and U1387 (36.8˚N, 7.7˚W; 559 mwd). The three sites show a similar long trend G/I pattern, however, significant latitudinal and coastal warmest conditions occurred during pre-MPT interglacials. The SST absolute values are extremely high in the Gulf of Cadiz, Site U1387, pointing out the importance of local oceanographic dynamics in driving the SST variability.

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Exploring fauna behaviour using baited cameras on the pockmarks located in the Capbreton Canyon System (Cantabrian Sea)

Cristina Rodríguez-Cabello*[1], Alberto Abad-Uribarren[1], Augusto Rodríguez-Basalo[1], Juanma Rodríguez[1], Cesar-González Pola[2], Pilar Ríos[2], Elena Prado[1], Larissa Modica[1], Javier Cristobo[2], Francisco Sánchez[1]

[1*] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain, cristina.cabello@csic.ieo.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Gijón (IEO-CSIC), Spain.

Key words: *Lander, deep-sea, Baited camera, tide, pockmark.*

Baited underwater cameras are being used in marine ecosystems as a non extractive, cost-effective method for assessing the fish fauna with minimal species bias. The use of non-invasive methods is becoming more and more crucial, particularly in the study of singular habitats or vulnerable species. Five multiparametric benthic platforms (landers) incorporating baited cameras and sensors (pressure, temperature and salinity) were deployed in the Capbreton Canyon System (Southern Bay of Biscay) in 2020, at depths of 287–905 m. A total of 7800 images were taken during an average of 24 h recording each deployment (23-28 h). Twelve benthopelagic fish species (4 elasmobranchs and 8 osteichthyes) and eighteen invertebrate species were identified from images. The great fork-bearded (*Phycis blenoides*) and the blackmouth catshark (*Galeus melastomus)* were the most often observed among fishes. In the case of invertebrates the gastropod *Colus* sp was recorded in all deployments. Three landers were situated inside a pockmark depression. Species attracted to the bait were not different from other areas of same depth range on sedimentary bottoms of the Cantabrian Sea. Comparison among faunal compositions from different sites indicated that depth is the main factor for grouping sampling stations. Higher species richness was observed in the deeper stations varying between 18 and 15 species respectively.

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Epibenthic communities of pockmark fields in Capbreton canyon system (southern Bay of Biscay)

Cristina Rodriguez-Cabello[1*], Pilar Ríos[2], Larissa Modica[1], Alberto Abad[1], Augusto Rodríguez-Basalo[1], Javier Cristobo[2], Elena Prado[1], Beatriz Arrese[3], Joxe Mikel Garmendia[4], Ibon Galparsoro[4], Maria Gómez-Ballesteros[3], Francisco Sánchez[1]

[1*] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain, cristina.cabello@ieo.csic.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Gijón (IEO-CSIC), Spain.

[3] Instituto Español de Oceanografía, Centro Oceanográfico de Madrid (IEO-CSIC), Spain.

[4] AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Herrera Kaia, Portualdea z/g, 20110 Pasaia, Spain.

Key words: *benthic communities, deep-sea, pockmarks, Capbreton canyon.*

The aim of this study is to describe the epibenthic communities of Capbreton pockmark fields. This area is currently being studying within LIFE IP INTEMARES project to evaluate its potential inclusion in the Natura 2000 network as Site of Community Importance (SCI). Pockmark fields are considered as prioritary habitat type 1180 in the context of the EU Habitats Directive. Different sampling gears have been used to describe and characterize the macro-epifauna inhabiting this area. In this study we have used samples collected by a beam trawl gear during surveys conducted in 2019 and 2020. A total of 20 trawls were carried out in the study area, from which 11 of them were performed in the pockmark fields. Up to date 94 species have been identified. The most important taxon groups in terms of abundance are Crustaceans (28 sp.), Echinodermata (25 sp.) and Mollusca (21 sp.). Some of the most abundant species (density in number) identified have been: *Aporrhais serresianus*, *Hymenodiscus* sp., *Gracilechinus alexandri, Pontophilus spinosus*, *Gracilechinus acutus*, *Psilaster/Persephonaster*, *Pagurus alatus*, *Processa canaliculata*, *Munida perarmata*, *Calocaris macandrea* and *Persephonaster patagiatus*. Hierarchical cluster analysis was applied to obtain assemblages of samples in terms of species composition. Preliminary analysis showed that the main discriminate factor is depth. Two groups were identified, those hauls between 350-450 m depth and another group for hauls between 500-800 m. *A priori* the species identified are not different from other areas of same depth range on sedimentary bottoms of the Cantabrian Sea.

Acknowledgments. This study is conducted in the context of the LIFE IP INTEMARES project (Integrated, innovative and participatory management of the Natura 2000 Network in the Spanish marine environment) specifically developed within the action A.2.2 "Actions to improve the knowledge for the declaration of new marine spaces due to their importance for habitats".

Modeling megrims spatial distribution from commercial fleet activity

Jose Rodríguez-Gutierrez[1*], Jose Manuel González-Irusta[1], Augusto Rodríguez Basalo[1], Elvira Ceballos[1], Daniel Cano Fernandez[1], José Castro Pampillon[2], Manuel Hidalgo[3], Antonio Punzón Merino[1]

[1*] Instituto Español de Oceanografía, Centro Oceanográfico de Santander, Av. de Severiano Ballesteros 16, 39004 Santander, Cantabria, jose.rodriguez@ieo.es

[2] Centro Oceanográfico de Vigo.

[3] Centro Oceanográfico de Baleares.

Key words: *species distribution model, commercial species, VMS and logbook data, environmental drivers, scientific fisheries sampling.*

Megrims are relevant commercial valuable species in the Iberian area where we can find 2 species, *Lepidorhombus whiffiagonis* and *L. boscii*. These species are not separated in the landings and management is currently carried out by a combined total allowable catch (TAC) and same technical measures for both of them. The present study is focused on the distribution of the spawning component of these species along the North West Spanish Atlantic area and Cantabrian Sea and the environmental drivers that affect this distribution through the development of species distribution models.

Instead of a classical modelling based on scientific research surveys, we use fishing logbook and vessel monitoring systems (VMS) from the commercial fishing fleet and take advantage of a large biological fisheries sampling program both on board and on-shore to obtain relevant information as the species ratio and spawning component. This approach ensure temporal and spatial coverage is much wider than the performed by the Spanish research survey used to asses megrims in the area which only takes place around October each year. More than 50.000 fishing trips of the bottom otter trawl fleet targeting demersal species for the last ten years, from which around 1.300 were sampled by scientific observers on board or at port, are used to investigate the spatially structure environmental effects on species distribution as well as their temporal variation.

This study contributes for the first time in the area with a methodology based on merging vessels monitoring systems and scientific fisheries observation which could be used in the future to improve spatial management. The use of species distribution models, highly increasing for marine species, could serve both to determine environmental drivers affecting species distribution and improve management procedures that are more robust to spatial and temporal complexities. This study is part of the COCOCHA Project (Connectivity processes on fish populations and communities of Atlantic and Mediterranean ecosystems: linking ecological functions to management challenges), a broader effort to develop spatially explicit population dynamics and assessment models.

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Late Quaternary marine record of Climate Change in the Basque Basin

Julio Rodríguez-Lázaro*[1], Ana Pascual[1], Zeltia Varela[1], Blanca Martínez-García[2]

[1] Departamento de Geología, Universidad del País Vasco (UPV/EHU), B. Sarriena, 48940 Leioa, Bizkaia, julio.rodriguez@ehu.eus
[2] CN Instituto Geológico y Minero de España (IGME-CSIC). C/ Ríos Rosas 23, 28003 Madrid.

Key words: *MIS 5-MIS 1, foraminifera, ostracods, geochemistry, paleoecology.*

We present synthetic results of paleoceanographic and paleoclimatic reconstructions from the MIS 5 to Holocene time interval from marine cores of the southern Bay of Biscay. Based on detailed analyses of faunal distributions of benthic and planktonic foraminifers and benthic ostracods as paleo-indicators, together with the results of the chronology, isotopic geochemistry and sedimentological proxies (granulometry, magnetic susceptibility, spectrometry, elemental analyses), we characterize main climatic events in the paleoenvironmental evolution of this region of the Bay of Biscay during the last 140 ka. A more detailed study of MIS 5 allowed us to register in this basin the last interglacial (LIG) and the glacial inception.

Earths' climate during the last 140 ka (Last Glacial Cycle; MIS 5 to MIS 1) is characterized by sudden oscillation of cold and warm periods known as Dansgaard-Oeschger (D-O) events, with a 1470-year periodicity (lunisolar tidal cycle?). The oscillation is asymmetric, with rapid warming (8º-10ºC within decades) and more lasting cooling stages from centuries to a millennium. Each D-O oscillation is preceded by North Atlantic sea surface cooling and massive iceberg discharges (Heinrich events, HE). D-O oscillations represent sea level between 45m and 90m below present. D-O and Greenland stadials/interstadials (GS/GI) events are the atmospheric response and HE (Heinrich events) the oceanic response to millennial climate variability. This millennial variability is the abrupt change of atmospheric temperature in high latitudes of Northern Hemisphere with no apparent insolation or external (astronomical) forcings. Causes of global D-O and HE are changes in AMOC (Atlantic Meridional Overturning Circulation) by fresh water influx, solar irradiance, ice-sheet thickness and Arctic sea-ice cover. Two hypotheses explaining the causes for these changes are in discussion: 1) The shutdown of AMOC caused by dilution of N Atlantic water mases due to melt water pulses, and 2) Abrupt warming produced by stratified warm subsurface waters below the halocline and sea ice in Norwegian and North Atlantic seas.

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Aplicación de datos batimétricos en la cartografía geológica de la plataforma continental. Un ejemplo de la costa occidental del País Vasco

Lidia Rodríguez-Méndez[1*], Néstor Vegas Tubía[1], Aitor Aranguren Iriarte[1]

[1*] Universidad del País Vasco UPV/EHU, Facultad de Ciencia y Tecnología, Departamento de Geología. 48940 Leioa, lidia.rodriguez@ehu.eus

Palabras clave: *Geología submarina, Cuenca Vasco-Cantábrica, Sinclinorio de Bizkaia.*

Este trabajo muestra un ejemplo de mapa geológico de la plataforma continental realizado a partir de técnicas de detección remota, como son los datos batimétricos. En este caso, se ha utilizado una batimetría de alta resolución (tamaño de píxel = 5m) de la costa de Bizkaia, entre los 8 y los 80 m de profundidad. La batimetría se realizó con un sistema de ecosondas multihaz enfocado, con frecuencia de operación de 400 kHz y un total de 256 haces en un sector angular de 130º. Para completar la banda más cercana a la costa, entre los 0 y los 8 m de profundidad, en la que no había datos de batimetría, se llevó a cabo una revisión de los afloramientos costeros y de la zona intermareal en periodos de bajamar con mareas vivas, así como un análisis de fotografías aéreas de dicho sector. Toda la información de partida y los nuevos datos generados se han integrado en un Sistema de Información Geográfica (SIG).

El objetivo de este trabajo ha sido prolongar hacia la plataforma las formaciones sedimentarias y las estructuras geológicas diferenciadas en mapas previos de la zona continental (Hojas 37-III y 37-IV, EVE, 1:25.000). Para ello, se han distinguido, en primer lugar, las zonas con fondo rocoso de aquellas cubiertas por sedimentos cuaternarios. Además, en las zonas con fondo rocoso se han establecido líneas de capa representativas de la dirección de la estratificación.

La abundancia de los afloramientos rocosos en la costa occidental del País Vasco y la calidad de los datos batimétricos ha permitido extender las formaciones y las estructuras cartografiadas en tierra hacia el mar y se han podido reconocer estructuras nuevas, como pliegues y fallas. Entre otras cuestiones, la traza axial del Sinclinorio de Bizkaia se ha prolongado más de 13 km mar adentro y se han reconocido tres familias de fallas con orientaciones predominantes: N030ºE, N170ºE y N120ºE.

Este trabajo pone en evidencia el interés del análisis de las batimetrías de la plataforma continental con el fin de extraer datos geológicos con los que prolongar, e incluso modificar y mejorar, las cartografías geológicas regionales.

Short term evolution of a small dredged test area in the Algarve southern inner shelf

Marcos Rosa[1*], Teresa Drago[1, 2], Sebastião Teixeira[3], Rui Taborda[2], Jacqueline Santos[1]

[1*] Instituto Português do Mar e da Atmosfera, Lisboa, Portugal, marcos.rosa@ipma.pt
[2] Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal.
[3] Agência Portuguesa do Ambiente/ARH Algarve, Faro, Portugal.

Key words: *beach replenishment, sedimentary dynamics, multibeam surveys, sediment grain size analysis.*

The inner shelf is a dynamically complex region where the sedimentary processes are still poorly understood. During a beach replenishment operation in the southern Portuguese coast (Belharucas, between Albufeira and Vilamoura) in June 2017, an opportunity aroused of an experiment to understand the morphological evolution of a sand pit created by sand extraction and to estimate its natural recover (refill) time scale. For this purpose, a small area (140 x 140m) at 11m depth (MSL), close to the designated borrow area was chosen. The dredging operation was made by suction, producing a set of curved, narrow ditches, with some overlapping, distributed in an area of 4300m^2. A multibeam survey was made just before the dredging to map the seabed in its original state. Ten days after the dredging an underwater inspection was made via scuba diving, showing that the ditches were still very well preserved (with maximum heights up to 1.6m) as they were cut in an aggregated sandy formation. Subsequently, three high resolution multibeam surveys were made to measure the morphological evolution at 23 days, 5 and 11 months respectively. The last multibeam survey showed that the seabed had almost totally recovered to its initial morphology. In addition to the bathymetric surveys, sediment sampling was performed by scuba divers in order to monitor the seabed sediments properties after the dredging and till May 2019. The samples were collected in a fixed spot of the dredged area and in a control point. Results showed that the sediments are essentially sand with some gravel (<10%). After the dredging, the sediments exhibited a higher variability in mean grain size (1.29Ø-0.08Ø) but one year after the grain size became very uniform, slight finer than before the dredging and with a mean diameter of 0.7Ø. The results show that at the study site, morphological changes can be related with EMMA storm recorded between 28 February-6 March 2018, at the Faro buoy.

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Long-term changes of wind and waves in the Bay of Biscay (1979-2019)

Jon Sáenz[1, 2*], Gabriel Ibarra-Berastegi[3, 2], Alain Ulazia[4], Paula Serras[3], Santos J. González Rojí[5, 6], Ganix Esnaola[2, 7]

[1] Dept. of Physics, University of the Basque Country (UPV/EHU), Sarriena Auzoa z/g, 48940 Leioa, Spain, jon.saenz@ehu.eus

[2] Plentziako Itsas Estazioa (PIE), University of the Basque Country (UPV/EHU), Areatza Pasealekua, 48620 Plentzia, Spain.

[3] Dept. of Energy Engineering, University of the Basque Country (UPV/EHU), Bilbao Engineering School, Torres Quevedo Ingeniaria Plaza, 1, 48013 Bilbao, Spain.

[4] Department of Energy Engineering, University of the Basque Country (UPV/EHU), Gipuzkoa Engineering School, Otaola Hiribidea, 29, 20600 Eibar, Spain.

[5] Oeschger Centre for Climate Change Research, University of Bern, Oeschger Centre, Hochschulstrasse 4, CH-3012 Bern, Switzerland.

[6] Climate and Environmental Physics, University of Bern, Physics Institute, Sidlerstrasse 5, CH-3012 Bern, Switzerland.

[7] Department of Energy Engineering, University of the Basque Country (UPV/EHU), Gipuzkoa Engineering School, Europa Plaza 1, 20018 Donostia, Spain.

Key words: *Theil-Sen, Self-organizing Maps.*

Long-term changes in wind and waves in the Bay of Biscay have been evaluated by using ERA5 hourly data. ERA5 provides a spatial resolution of 0.5ºx0.5º for oceanic and 0.25ºx0.25º for atmospheric variables. The geographical boundaries of the study cover the Bay of Biscay, with 16 longitudes in the [-9º E, 1.5º E] interval and 11 latitudes in [43.5º N, 48.5º N] (176 grid points).

The wave climate trends were calculated for the Bay of Biscay using 492 monthly wave energy flux (WEF) averages (period 1979–2019) at the 176 grid points. The trends were estimated using monthly anomalies. A Theil-Sen robust estimator allowed obtaining the trends and their significance at a 95% confidence level. The results show an increasing trend in the whole area with higher values in the outermost areas of the Bay of Biscay. Following the same methodology, period and area, wind speed trends were also computed. Results indicate a non-uniform behavior in the area, with negative trends in the northeastern part of the Bay of Biscay and mild positive trends in the south-west. A more specific analysis of WEF trends was carried out for the area near the Mutriku wave farm and 10 sea-state types were identified using Self-Organizing Maps. The changes in the frequency of occurrence of three sea-state types explain the trends. The positive trends tend to concentrate on the swell with a general shift northwards of the incoming direction of WEF.

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The importance of species selection for assessing the vulnerability of marine communities to climate change and trawling using trait-based indices

Marta Sainz Bariain[1*], Julia Polo Sainz[1], Manuel Hidalgo[2], Antonio Punzón[1], Encarnación García[3], Miguel Vivas[3], Antonio Esteban[3], Luis Gil de Sola[4], Lucía López López[1]

[1*] Centro Oceanográfico de Santander (COST-IEO), CSIC, marta.sainz@ieo.csic.es
[2] Centro Oceanográfico de Illes Balears (COB-IEO), CSIC.
[3] Centro Oceanográfico de Murcia (COMU-IEO), CSIC.
[4] Centro Oceanográfico de Málaga (COMA-IEO), CSIC.

Key words: *Biological traits, vulnerability, fishing pressure, Cantabrian and Mediterranean seas.*

Traits-based approaches, that is, studies focused on functional properties of organisms (traits or attributes) rather than taxonomic information of species, provide various advantages as an alternative method to study biological communities and their functioning. Furthermore, they can be used to elucidate the effects of environmental or anthropogenic stressors on the community composition and ecosystem functioning. The main advantage over taxonomic studies is not only to understand the changes that occur in the communities but also to understand which characteristics of the species provide them with an adaptive advantage. Hence, these studies are of vital importance for applied ecology, from monitoring the effects of global change to planning effective management strategies for marine ecosystems. However, deciding which species or traits to select it is not trivial as it depends on the nature, structure, and functional diversity of each community.

The main objective of this study is thus to identify the appropriate selection of species to characterize, according to their biological traits, the sensitivity of the demersal communities of Atlantic and Mediterranean shelves in the Iberian Peninsula to climate change, trawling and their interaction. To conduct this study, we compiled information for 15 biological traits of the most recurrent 247 demersal species from two annual long-term monitoring data of standardized bottom trawl surveys conducted in the Atlantic (DEMERSALES) and Mediterranean (MEDITS). These traits were selected based on general knowledge of the effect of mentioned impacts on the species and gathered by consulting online databases (i.e. WoRMS, BIOTIC, FishBase or SeaLifeBase) and reviewing more than 200 scientific publications. Thus, we compiled information for one trait related to the environmental niche (sensitive to climate change), four traits related to their habitat and morphology (sensitive to trawling), and 10 related to the life-history of the species (sensitive to both impacts).

Our analysis confirmed that the availability of biological information is strongly biased towards abundant and large species, particularly those of fisheries importance or of conservation concern. In this sense, preliminary results indicate that a strict selection biased towards these groups of species is sufficient to characterize the sensitivity of the entire community in both areas.

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Advances in non-invasive methods in the study and monitoring the conservation status of deep-sea benthic vulnerable habitats

Francisco Sánchez[*1], Juan Manuel Rodríguez[1], Elena Prado[1], Cesar González-Pola[2], Augusto Rodríguez-Basalo[1], Cristina Rodríguez-Cabello[1], Alberto Abad-Uribarren[1], Larissa Modica[1], Pilar Ríos[2], Javier Cristobo[2]

[1*] Instituto Español de Oceanografía, Centro Oceanográfico de Santander (IEO-CSIC), Spain, francisco.sanchez@ieo.csic.es

[2] Instituto Español de Oceanografía, Centro Oceanográfico de Gijón (IEO-CSIC), Spain.

Key words: *Image analysis, ROVs, underwater photogrammetry, Marine Protected Areas.*

Spain is one of the richest European countries in terms of marine biodiversity and in the last years great advances and efforts were done to consolidate a significant number of Marine Protected Areas (MPAs) in the Natura 2000 network. Establishing practical strategies and guidelines for low-impact monitoring and research of MPAs is recommended. It is necessary to develop nondestructive and minimally invasive sampling in order to obtain time-series data avoiding damage in vulnerable habitats. In this scenario, and within different projects (e.g. ECOMARG, INDEMARES, INTEMARES, LanderPick, DeepRamp), the Santander laboratory of the Spanish Institute of Oceanography currently is developing different camera systems allowing mapping and describing several vulnerable habitats of deep-sea: cold-water coral reefs, gorgonian forests, deep-sea sponge aggregations and black coral gardens. In these studies, non-invasive methodologies based on sampling with ROVs (remotely operated vehicles), ROTVs (towed vehicles) and landers (multi-parametric platforms moored on the bottom) were developed. These methods were applied in deep sea areas up to 2000 m depth. In this study a review of the development of the different methods and their application will be presented.

The use of towed vehicles (ROTVs) equipped with cameras (still photo and video) allowed to obtain high-resolution cartography of vulnerable habitats which has been used in the spatial design of the management measures of the MPAs. Selective sampling using ROVs increasing the biodiversity inventories of deep-sea habitats and improve knowledge about the environmental factors that influence their distribution. More recently, modern techniques based on photogrammetry and deep-learning have made possible to monitor gorgonian forest population status and carry out growth studies of deep-sea sponges, and also progress substantially in the automatic identification of species from huge amounts of geo-referenced images. Finally, the studies done using landers have provided very valuable information on the behaviour of many benthic species and their relationship with the oceanographic dynamics near the bottom.

Acknowledgments. Special thanks to the crews of the oceanographic vessels on which the different systems designed have been tested and used.

Sea level data-derived local/regional coastal tectonics in SW Iberia during the Holocene

Juan I. Santisteban[1*], Rosa Mediavilla[2], Cristina Val-Peón[3], José A. López Sáez[4], Margret Mathes-Schmidt[3], Klaus Reicherter[3]

[1*] Dpt. Geodynamics, Stratigraphy and Paleontology, Fac. Geological Sciences, Complutense University of Madrid, C/José Antonio Novais 12, 28040-Madrid, Spain, j.i.santisteban@geo.ucm.es

[2] Centro Nacional Instituto Geológico y Minero de España, CSIC, C/Ríos Rosas 23, 28003 Madrid, Spain.

[3] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstrasse 4-20, 52056-Aachen, Germany.

[4] Centre for Human and Social Sciences, CSIC, C/ Albasanz 26-28. 28037 Madrid, Spain.

Key words: *relative sea level, Holocene tectonic rates, SW Iberia tectonic events, sedimentary sequences, local vs. regional tectonics.*

Coastal tectonics in SW Iberia have usually been estimated from outcropping structures or the displacement of reference levels on land. By its side, the study of sediments has been used for deformation analysis using syntectonic structures or identifying tectonics as the triggering mechanism of sedimentary sequences. However, the use of sequence stratigraphy basic ideas and the adaptation of classical techniques like backstripping can be useful to identify tectonic events or trends and a quantification of the related displacements or rates from sedimentary records.

In this example, the sedimentary record of different cores from La Janda rocky lagoon, SW Spain, were used to identify tectonic events and trends during the Holocene. The depositional sequences are composed of siliciclastic sediments recording from subtidal to coastal fluvial environments. Sedimentary, geochemical and fossil proxies were used for the precise location of bathymetric reference points that were compared against global sea level model data to make an estimation of the local tectonic subsidence/uplift rates.

The comparison of the resulting tectonic rates vs. previous nearby studies reveal that short-term or single event rates can be much greater than the long-term reconstructed rates for this region. Several previous studies point to this conclusion in other areas under similar tectonic settings.

The analysis of these results vs. several reconstructions of Holocene local relative sea level for SW Iberia (Spain and Portugal) allows to make an estimation of the local or regional character of such events and trends and to make a segmentation of the coastal area based on their tectonic behaviour.

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Internal Solitary Wave effects on acoustic Doppler current profiler (ADCP) backscattering patterns in the water column (Figueira da Foz – W Portugal)

A.I. Santos[1*], J. Magalhães[2], A. Oliveira[1, 3], P.B. Oliveira[4], R. Nolasco[5], N. Zacarias[1], A. Amorim[6]

[1*] Instituto Hidrográfico, Rua das Trinas 49, 1249-093 Lisboa, Portugal, ana.santos@hidrografico.pt

[2] Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), 4450-208 Matosinhos, Portugal.

[3] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal.

[4] Instituto Português do Mar e da Atmosfera (IPMA), Algés, Portugal.

[5] Centre of Environmental and Marine Studies (CESAM), Universidade de Aveiro, Aveiro, Portugal.

[6] Centro de Ciências do Mar e do Ambiente (MARE), Faculdade de Ciências, Universidade de Lisboa, Portugal.

Keywords: *ADCP, HAB's, ISW, particles, zooplankton.*

Project HabWAVE investigates the processes that determine harmful algae bloom (HAB) initiation, emphasizing on the benthic resting stages (cysts) of some dinoflagellate species. Under the scope of this project, a mooring line was deployed at the 113 m isobath off Figueira da Foz (W Portugal) and operated from 7-19 September 2019, equipped with five self-recording thermistors and two ADCPs: one up-looking 300 kHz covering the top 90 m of the water column, and one down-looking 1200 kHz covering the bottom 10 m. ADCP (acoustic Doppler current profilers) backscatter (ABS) has been used to estimate suspended sediment concentration, and sometimes size, in various environments. This work addresses the complex interplay of acoustic backscattering patterns (as a proxy of suspended particles in the water column), observed during the HabWAVE'19 survey, especially in what concerns the effect of the passage of Internal Solitary Waves (ISW) on water column particle dynamics. Previous studies have shown a strong activity of ISWs over the Portuguese shelf during late spring and summer and the discussed dataset is no exception. These waves are readily observed in radar satellite images as well as in-situ data, linked to a variety of oceanographic processes, from sediment resuspension to the modulation of near-surface chlorophyll-a distribution and primary production. In this dataset, ISW events are represented by significant fluctuations in thermocline depth, in the order of 10-30 m, reaching maxima of ≈ 40 m occurring independently of the semi-diurnal tidal phase or time of day. These fluctuations affect not only the depth of the maxima accumulated at the thermocline depth, but also the particle patterns throughout the top 90 m of water column. Evidence of bottom sediment resuspension events at near bottom levels during ISW passage is present, but not consistent and seems to be a result of a complex interplay of several variables (ISW provenance and amplitude, quarti-diurnal tidal phase and water column density structure).

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Multiproxy characterization of high energy layers in the inner continental shelf of Quarteira (Southern Portugal) – Preliminary results

Jacqueline Santos[1*], Teresa Drago[1, 2], Delminda Moura[3, 4], Vitor Magalhães[1, 2], Cristina Roque[5], Pedro F Silva[2, 6], Ana Isabel Rodrigues[1], Pedro Terrinha[1, 2], Anxo Mena[7], Guillermo Francés[7], Ana Lopes[1, 8], Ana Alberto[2], Maria Ana Baptista[2, 6]

[1] Instituto Português do Mar e da Atmosfera, Lisbon, Portugal, jacqueline.santos@ipma.pt

[2] Instituto Dom Luiz, University of Lisbon, Lisbon, Portugal.

[3] Centro de Investigação Marinha e Ambiental, Faro, Portugal.

[4] Universidade do Algarve, Faro, Portugal.

[5] Estrutura de Missão para a Extensão da Plataforma Continental, Paço d'Arcos, Portugal.

[6] Instituto Politécnico de Lisboa, Instituto Superior de Engenharia de Lisboa, Lisbon, Portugal.

[7] Centro de Investigación Mariña da Universidade de Vigo, Spain.

[8] Universidad of Salamanca, Salamanca, Spain.

Key words: *Algarve continental shelf sedimentary record, sand mineralogical composition, sediment sources.*

The occurrence of sedimentary layers indicating high energy events is common in the continental shelves sedimentary record. Their presence has been usually related either to tsunami waves or storm waves. In both cases, the identification of the transport mechanism requires a variety of proxies. This work presents the preliminary results of the analysis of a gravity core (MW-107) collected at ca. 57 m water depth in the inner continental shelf of Quarteira (Algarve) and aims to identify potential high energy events. Based on variations in grain-size, geochemical (XRF) and magnetic parameters, four layers were identified as potential high energy event related (L1-L4 from the top towards the bottom). A detailed study of mineralogical elements within these layers was also performed in order to identify the possible coastal sediment sources. For this purpose, the sand mineralogical composition of the core layers L1-L4, as well as the adjacent coastal zone samples, were analysed under a binocular microscope. The results showed the existence of two mineralogical elements - "iron-coated quartz" and "orange clay aggregates"- that were identified in some levels of the defined core layers and in coastal sites, especially from Forte Novo and Vale do Lobo cliffs. Overall, this study provides an additional information to the ASTARTE continental related material proxies. However, the transport mechanism (storm/tsunami waves) for these sediments is still a work in progress.

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First steps in the development of intensive aquaculture of the thicklip grey mullet *Chelon labrosus* (Risso, 1827)

Markel Sanz-Latorre[1*], Nadia Conlledo[2], Dominic Mensah[3], Javier Goikoetxea, Urtzi Izagirre[1], Manu Soto[1], Ruben Sudupe[2], Pilar Brettes[4], Alberto de Diego[5], Xabier Lekube[1]

[1] CBET Research Group, Department of Zoology and Animal Cell Biology, Faculty of Science and Technology, University of the Basque Country UPV/EHU, Sarriena z/g, Leioa, Basque Country, Spain, markel.sanz@ehu.eus

[2] Kardala LHII Akuikultura Eskola, Portua z/g (Kofradia eraikina), 20830 Mutriku, Euskal Herria, Spain.

[3] Department of Animal and Aquacultural Sciences, Norwegian University of Life Sciences, P.O. Box 5003, NO1432 Ås, Norway.

[4] Centro Tecnológico GAIKER, Parque Tecnológico Edificio 202, 48170 Zamudio, Bizkaia, Spain.

[5] Department of Analytical Chemistry, Faculty of Science and Technology, University of the Basque Country UPV/EHU, P.O. Box 644, 48080 Bilbao, Basque Country, Spain.

Key words: *sustainable aquaculture, alternative feeds, animal welfare.*

The thicklip grey mullet *Chelon labrosus* (Risso, 1827) has been targeted as an interesting species for aquaculture diversification in Spain, mainly due to its omnivorous feeding habits, which gives it a great potential for the use of innovative and sustainable feeds. In the present research, a 686-day experiment was conducted to test the suitability of the species for intensive culture and its response to different commercial feeds, to gather preliminary data as a baseline for the development of specific feeds for it. With this purpose, two groups of C. labrosus were separated and fed two different diets, one designed for trout (carnivorous; 44.5 % protein, 21 % lipid and 24.72 mg protein / KJ) and the other for tilapia (herbivorous; 32 % protein, 6 % lipid and 17.02 mg protein / KJ). By the end of the experiment, no significant mortalities were recorded. The group fed trout feed (high protein and lipid content) provided the best growth and feed utilization results, and both feeds led to high lipid deposition in liver although no related health issues were observed. Both experimental groups showed a similar muscle lipid content by the end (21 and 22 %). This shows the ability of *C. labrosus* for de novo lipogenesis when dietary energy is provided in carbohydrate form. In the group fed the diet rich in carbohydrates, a more balanced and desirable muscle fatty acid profile was identified. Therefore, it is concluded that *C. labrosus* is a suitable species for intensive aquaculture, and that the starting point for the development of a specific feed for it should be feeds with high contents of protein and energy to promote growth, but such energy should be provided preferentially by carbohydrates, as the fish showed a more desirable fatty acid profile when they synthesized their own lipids. The importance of long-term feeding experiments when studying new species for aquaculture is also stated.

Distribution of the alien bivalve *Xenostrobus securis* (Lamarck, 1819) in the coast of Bizkaia (northern Iberian Peninsula) and its relationship with the indigenous *Mytilus galloprovincialis* Lamarck, 1819

Markel Sanz-Latorre[1*, 2], Manu Soto[1, 2], Oihane Diaz de Cerio[1, 2], Irune Valenciano[2], Mónica Gutiérrez[3], Urtzi Izagirre[1, 2]

[1*] Research Centre for Experimental Marine Biology and Biotechnology PIE, University of the Basque Country UPV/EHU, Areatza 47, Plentzia, Basque Country, Spain, markel.sanz@ehu.eus

[2] CBET Research Group, Department of Zoology and Animal Cell Biology, Faculty of Science and Technology, University of the Basque Country UPV/EHU, Sarriena z/g, Leioa, Basque Country, Spain.

[3] Department of Zoology and Physical Anthropology, Faculty of Biology, Universidad Complutense de Madrid, C/ José Antonio Novais s/n, Madrid, Spain.

Key words: *invasive species, estuary, Bay of Biscay.*

The present work is the first in-depth biogeographical study of the presence of the invasive bivalve *Xenostrobus securis* (Lamarck, 1819) in the Basque coast, and an attempt to understand its distribution and relationship with the indigenous competitor *Mytilus galloprovincialis* Lamarck, 1819 in a series of estuaries along the Basque Coast. The presence of *X. securis* in the Barbadun, Butroe, Oka, Lea and Artibai estuaries has been reported for the first time, and the knowledge of its distribution in the estuary of Nerbioi is completed. Field observations and identification of the different species of mussels were contrasted by molecular identification (MiniCOI gene; Glu-5´) of several individuals collected in every estuary. Distribution maps of each estuary are presented, and the relationship with the indigenous mussel *M. galloprovincialis* is discussed in the Butroe and Nerbioi estuaries. Present results suggest that this species is an exceptional ecosystem colonizer, and there is a real possibility of massive spreading to northern coastal areas, displacing *M. galloprovincialis*. The ecological implications of this invasion and the affections to ecosystem services in the Biscay Bay deserve further investigations.

Acknowledgements. The authors thank for technical and human support provided by the Sequencing and Genotyping service of the SGIker (UPV/EHU/ ERDF, EU). Special thanks to Denis Benito for the mussel photographs taken for the study.

Tracking abrupt climatic events for the last 40 kyr in SW Iberia (Gulf of Cadiz) – Preliminary results

P.F. Silva[1*, 2], M. Gomes[2], T. Drago[2, 3], C. Roque[2, 4], B. Alonso[5], F. Naughton[1, 6], G. Ercilla[5], N. López-González[7], D. Casas[8], J.T. Vázquez[7]

[1*] Instituto Superior de Engenharia de Lisboa (ISEL – IPL), Physics Department, Lisboa, Portugal, pedro.fsilva@isel.pt

[2] Instituto Dom Luiz (IDL – Universidade de Lisboa), Lisboa, Portugal.

[3] Instituto Português do Mar e da Atmosfera – IPMA, Lisboa, Portugal.

[4] Estrutura de Missão para a Extensão da Plataforma Continental (EMEPC), Paço de Arcos, Portugal.

[5] Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain.

[6] Centro de Ciências do Mar (CCMAR), Univ. Algarve, Faro, Portugal.

[7] Instituto Español de Oceanografia (IEO - Centro Oceanográfrico de Málaga), Málaga, Spain.

[8] Instituto Geológico y Minero de España (IGME), Madrid, Spain.

Key words: *Portimão Bank, piston core, abrupt climatic events, Late Pleistocene-Holocene transition.*

The last 40 kyr encloses the Late Pleistocene-Holocene transition, mainly characterized by an evolution from a glacial to an interglacial period. Moreover, this temporal window presents important abrupt climatic oscillations, like the Heinrich events (H1 to H4), Green Sahara, Greenland stadials and Younger Dryas event. The effects of this complex climatic evolution in the southern offshore Portugal still poorly understood. Moreover, the origin of the sedimentary layers related to abrupt climatic changes still a matter of debate, being pointed three main hypotheses: i) melting of icebergs around core location, i.e., the polar front reached lower than presently thought; ii) dust that comes from NW Africa and; iii) deposition of contourites from the Mediterranian in Algarve offshore oceanic basin during cold periods. In order to track these abrupt events a piston core with 350 cm length, retrieved at 3520 m water depth south of Portimão Bank, underwent detailed environmental magnetism, sedimentological (grain-size, carbonates, organic matter) and X-ray fluorescence (XRF) geochemical analyses, complemented by AMS ^{14}C dating. Preliminary results of this multidisciplinary approach well identify all the main abrupt climatic events known for the last 40 kyr, being the source of the main ferromagnetic phases discussed.

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Characterization of the benthic communities in the Tagus Delta: The macrofauna within the methane gas polygon

Raquel Soares[1, 2*], Jorge Lobo-Arteaga[1, 3], Cátia Bartilotti[1, 3]

[1]* Instituto Português do Mar e da Atmosfera, I.P. (IPMA), Av. Alfredo Magalhães Ramalho 6, 1495-165 Algés, Portugal, raquel.cruz.soares@gmail.com

[2] Escola Superior de Tecnologia do Barreiro, Instituto Politécnico de Setúbal, Rua Américo da Silva Marinho, 2839-001 Lavradio, Portugal.

[3] Centro de Ciências do Mar e do Ambiente (MARE), Universidade NOVA de Lisboa, Campus de Caparica, 2829-516 Caparica, Portugal.

***Key words**: Benthic habitats, Biodiversity, Lisboa canyon, methane gas, integrative taxonomy.*

In March 2021, within the scope of several research projects, after the identification of a polygon of methane gas trapped in depth in the Lisboa canyon, offshore the Tagus Delta, an oceanographic campaign took place. This oceanographic campaign aimed at i) understand the origin, nature and distribution of the gas trapped in the sediments of the submarine Tagus Delta; ii) determine the profile concentrations of several contaminants in the sediments column representing the last 100 years of deposition; and, iii) characterize the benthic macrofauna community of a total of 15 sampling stations performed, in depths varying from 35 to 128 m. The samples were collected in triplicates and sieved using a 0.5 mm mesh for benthic macrofauna, and a small sample of sediment was used for the analysis of grain size and organic matter. The benthic organisms were sorted and preserved according with different protocols (absolute ethanol or 4% formaldehyde). The collected organisms were identified to the lowest possible taxonomic level through integrative taxonomy, combining morphological characters with genetic markers (DNA barcoding). The results of the 6 stations within the methane gas polygon are herein presented. A total of 162 specimens were morphologically identified as phyla Echinodermata (classes Holothuroidea and Ophiuroidea), Arthropoda (class Malacostraca), Mollusca (classes Bivalvia and Gastropoda), Annelida (order Sipuncula, classes Oligochaeta and Polychaeta), and Cnidaria (class Anthozoa). Preliminary results show that the predominant groups in these samples were amphipods, polychaetes and bivalves. Specimens lacking diagnosing morphological characters were selected and identified through molecular DNA barcodes.

Acknowledgements. Pedro Terrinha is thanked for the coordination of the oceanographic campaign, crew members and scientific team onboard. Study supported by programme MarBIS – Marine Biodiversity Information System financed through the Portuguese Government, the TAGUSGAS project (PTDC/CTA-GEO/31885/2017) financed through the FCT and the CSS project (MAR-01.04.02-FEAMP-0013) through FEAMP- Mar2020. Other supports were provided by the Marine and Environmental Sciences Centre (MARE) financed by national funds from FCT/MCTES (UIDB/04292/2020).

Mica flakes and framboidal pyrite in the Gulf of Cadiz contourites as accurate proxies for Mediterranean Overflow strength

Javier P. Tarruella[1*], Thibauld M. Béjard[1], Francisco J. Sierro[1]

[1*] Universidad de Salamanca, Departamento de Geología, Plaza de los caídos s/n, 37008 Salamanca, España, pereztarruella@usal.es

Key words: *MOW strength, millennial-scale variability, Gulf of Cadiz, Contourite Depositional System.*

Detrital grains content in contourite sediments has been used as a Mediterranean Overflow Water (MOW) strength proxy along Iberian Margin in different ways. Fine sand fraction is considered to be an allogenic-detrital component and is widely used as a MOW strength proxy, whereas the coarser fraction mainly consist of pelagic and bioclastic particles. However, non-biogenic mineral grains may be present in coarse fractions, due to its hydrodynamic properties or to its authigenic origin. In the same way, authigenic and biogenic grains may also be present in fine sand. Here we visually classified and quantified >150 mm mineral grains of a few hundred samples from IODP Site U1389 located on the main branch of the MOW in the gulf of Cádiz. Authigenic and allogenic grains concentrations were compared with widely used MOW strength proxies over the last 90 kyr.

Most of non-biogenic >150 mm grains are mica flakes and framboidal pyrite in widely varying proportions. Mica flakes content and MOW strength proxies are highly correlated throughout the record. That illustrates the hydrodynamic equivalence of medium-coarse sand mica flakes to fine sand or sortable silt heavy minerals. Framboidal pyrite particles content is inversely proportional to MOW strength proxies. Considering that framboidal pyrite precipitates mainly during early anoxic diagenesis within the top cm of sediments, we suggest that pyrite content is related to the absence or weakness of MOW, which provides oxygen. Larger size of pyrite particles has been noticed in slow MOW conditions samples corresponding to Mediterranean sapropel events, as expected in environments with better conditions for framboidal pyrite formation.

Both mica flakes and pyrite content are independent MOW strength proxies: >150 mm mica flakes can be considered as fine sand or sortable silt equivalent in contourite drift sediments; framboidal pyrite content reflects redox conditions which depend on oxygen input from the more ventilated Mediterranean Sea through the MOW influence. Here we validated Mica/pyrite particles ratio as an accurate current strength proxy, which clearly reflects the millennial-scale variability of MOW.

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New clues on the Alboran Sea geodynamic evolution from magnetic anomalies

Víctor Tendero-Salmerón[1*], Jesús Galindo-Zaldívar[1, 2], Elia d'Acremont[3], Manuel Catalán[4], Yasmina M. Martos[5], Abdellah Ammar[6], Gemma Ercilla Zárraga[7]

[1] Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), 18100 Armilla (Granada), Spain, vtendero@ugr.es

[2] Departamento de Geodinámica, Universidad de Granada, 18071 Granada, Spain.

[3] Sorbonne Université, CNRS-INSU, Institut des Sciences de la Terre Paris, ISTeP UMR 7193, 75252 Paris Cedex 05, France.

[4] Real Observatorio de la Armada Española, 11100 San Fernando (Cádiz), Spain.

[5] University of Maryland College Park, College Park, MD 20742, USA.

[6] Faculté des Sciences, Université Mohammed V-Agdal, Rabat, Morocco.

[7] Instituto de Ciencias del Mar, Continental Margins Group, CSIC, 08003 Barcelona, Spain.

Palabras clave: *magnetic forward models, igneous intrusions, Alboran Sea opening, tectonic indentation.*

The magnetic anomalies of the Alboran Sea have been modeled along several profiles revealing the presence of crustal scale, basic igneous intrusions located at depths from 8 to 14 km. Some of them are located under volcanic highs, such as the Djibouti bank, but the most intense anomalies of central Alboran Sea are related to a NE-SW alignment of igneous intrusions located below the Alboran Channel that runs from the Ibn-Batouta bank to the East Alboran Basin. It is remarkable that these intrusions are northwards displaced with respect to the Alboran Ridge, which is supposed to be the main volcanic high of the Alboran Sea. The NE-SW elongated anomaly turns eastwards to NW-SE, paralleling to the Yusuf fault and reaching the Algerian coast, where it becomes more irregular. According with the geodynamic history of the Alboran Sea, the emplacement of these basic igneous intrusions may be related to the rifting of the AlKaPeCa Domain during Oligocene-Early Miocene. This rifting process, which is due to a NW-SE extension associated with slab retreat, led to the spreading of the Algerian basin and the individualization of the Alboran Domain. Thus, the intrusions would represent the western tip of that rift, since they have the same trend that the rift axis and are also not related with the Miocene volcanic highs. Afterwards, these intrusions were affected by the STEP fault (Subduction Tear Edge Propagator fault) that accommodated the westward displacement of the Alboran Domain along its southern limit. Since Late Miocene, the tectonic inversion of the Alboran basin curved the STEP fault and originated the Yusuf fault, along which some new intrusions could take place. During Pliocene-Quaternary, tectonic indentation was develop as a result of the Eurasia-Africa convergence and the reduction of the Alboran Domain westwards displacement. In this setting, the intrusions act as a backstop that have favored the folding and uplift of the Alboran Ridge in the front of the indenter. Altogether shows that the deep igneous intrusions originated during the extensional, initial stages of a basin can condition and control the style of the later tectonic inversion of the basin.

Crista Madeira-Tore: Investigação geológica, oceanográfica e biológica

Pedro Terrinha[1*, 2], Nuno Lourenço[3], Pedro Madureira[4], Mafalda Carapuço[1], Pedro Nogueira[5, 6], Jorge Arteaga[1], Clara Lopes[1], Luis Batista[1, 2], Hugo Ferreira[7], Vítor Magalhães[1, 2], Sandra Velez[5], Marta Neres[1, 2], Marta Nogueira[1], Manuel Seixas[8], António Calado[4], Andreia Afonso[4], Renato Bettencourt[4, 9], Bruno Ramos[4], Miguel Souto[4]

[1] Instituto Português do Mar e da Atmosfera IPMA, I.P., Lisbon, Portugal, pedro.terrinha@ipma.pt
[2] Instituto Dom Luiz IDL, University of Lisbon, Portugal.
[3] Colab + Atlântico.
[4] Estrutura de Missão para a Extensão da Plataforma Continental (EMEPC), Portugal.
[5] Universidade de Évora.
[6] Instituto de Ciências da Terra ICT, Portugal.
[7] Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência INESC TEC, Portugal.
[8] Centro Interdisciplinar de Investigação Marinha e Ambiental, CIIMAR, Portugal.
[9] Universidade dos Açores, Instituto do Mar (IMAR), Portugal.

***Palavras chave**: NE Atlântico, Investigação ambiental.*

Os objetivos principais das campanhas Crista Madeira-Tore (CMT) em 2021 e 2022 compreendem a aquisição de dados oceanográficos, biológicos e geológicos para a caracterização da sua baseline ambiental, incluindo a inventariação do lixo marinho, quer no fundo, quer na coluna de água, e a avaliação dos recursos. A CMT constitui um segmento de litosfera oceânica sobre-espessada por magmatismo, com ~1000 km de comprimento, paralela às anomalias magnéticas oceânicas. Os relevos são de origem vulcânica e estão associados a três episódios principais de natureza alcalina entre 103-80,5 Ma, 68 Ma e 30 Ma-presente. A campanha oceanográfica CMT – 2021 decorreu a bordo do NO Mário Ruivo do IPMA entre 20.11 e 04.12, entre Lisboa e a Madeira. Utilizaram-se vários métodos de recolha de informação: magnético, amostragem geológica e biológica de fundo, análise geoquímica de sedimentos e rochas, amostragem da coluna de água com recurso a CTDs e uCTDs, garrafas Niskin e dragas planctónicas para recolha quantitativa de microplásticos, imagem e amostragem com recurso ao ROV Luso. Foram testados ainda recursos e adaptações técnicas do navio Mário Ruivo, do ROV Luso e dum observatório oceanográfico multiparamétrico (sistema EGIM, EMSO-PT). Numa dragagem realizada ca. -1000 m, sobre o monte submarino Gorringe recolheram-se rochas sedimentares e magmáticas: arenitos marinhos, eventualmente circa-litorais, blocos bem rolados com ≤ 0,5 m afaníticos a subfaneríticos, às vezes porfiróides com olivinas ou piroxenas <5 mm, com encraves de calcários ou gabros, provavelmente basaltos alcalinos do final do Cretácico-início do Paleogénico, possivelmente constituindo o conglomerado de base de praias do Cenozóico. Em abril de 2022 realizou-se a campanha Madeira-Tore 2022 a bordo do NRP D. Carlos, dedicada ao mapeamento batimétrico multifeixe com retrodispersão de montes submarinos da CMT.

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Preliminary deep-sea data analysis collected at Gloria Seamount, Azores-Biscay Rise

Inês Tojeira[1*, 2], Luísa P.Ribeiro[1,3], Teresa Rafael[1], Mónica Albuquerque[1], Maria Simões[1], Pedro Madureira[1, 4]

[1*] EMEPC, Task Group for the Extension of the Continental Shelf, Paço de Arcos, Portugal, ines.tojeira@emepc.mm.gov.pt

[2] MARE, Marine and Environmental Sciences Centre, Faculty of Science, Lisbon University, Portugal.

[3] GeoBioTec, Aveiro University, Portugal.

[4] Dep. Geosciences and Institute of Earth Sciences, Évora University, Portugal.

Key words: *Mid-Atlantic Ridge, iMirabilis campaign, Ocean Island Basalts, faunal assemblages, ROV Luso.*

The Azores-Biscay Rise (ABR) is a 750 km long morphological feature trending NE-SW and rising more than 3000m on oceanic crust aging 76-36 Ma (An 33-24). It is located in the Northern Atlantic basin between the Azores Archipelago and the Biscay Abyssal Plain (40.5ºN, 21.5ºW – 45.3ºN, 15.5ºW). The southwestern part of the ABR is shallower, with several seamounts with summits at ~1900 m depth while the northeastern part is a broad convex feature with a seamount shallower than 3000 m at its northern end. During LEG0 of the iMirabilis deep-sea research cruise, in July 2021, the EMEPC scientific party onboard the Spanish R/V Sarmiento de Gamboa with the Portuguese Luso ROV visited the seamount located on the northern end of the ABR, named here as Gloria Seamount (45.03ºN, 15.54ºW). The team collected new multibeam bathymetry data and was able to conduct an 8 hour ROV dive on the Gloria Seamount. Our observations showed distinct seafloor coverage areas, ranging from fine sediment with ripple marks to increasingly coarser-grain and large blocks at the base of the slope, to outcrops with steep reliefs contained in a landscape dominated by successive ridges. The outcrops exhibit volcanic structures such as pillow lavas and lava flows, occasionally cut by fractures oriented W-SW. The deep-sea benthic assemblages differed with depth (ranging from 2600 and 2400 m depth) and seafloor substrates type. In sediment habitats, species like soft corals Anthomastus (Alcyonidae), whip corals (Cnidaria) and comatulids (Crinoidea) together with specimens of pink holothurian (Elpidiidae) were recorded; in hard substrates, stalked crinoids (Crinoidea) were mixed along with distinct coral specimens, such as bamboo corals (Isidiidae nodal), Styllasteridae, Bathypathes (Anthipatharia: Schizopathidae) and Umbellula (Pennatulacea: Umbellulidae). Glass sponges (Hexactinellida) were also recorded. The collected data provided the first insights on geological nature and on benthic community fauna of Gloria seamount.

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EMODnet: Nodo de información geoespacial para el análisis y modelización de distintos procesos en el medio marino

Javier Valencia Mtz. De Antoñana[1*], Gemma Ercilla Zárraga[2]

[1] LYRA ingeniería & consultoría, 01015 Vitoria-Gazteiz, Spain, javi.valencia.m@gmail.com
[2] Instituto de Ciencias del Mar, CSIC, Continental Margins Group, 08003 Barcelona, Spain.

Palabras clave: *infraestructura, servicios, geología, geoprocesamiento, GIS.*

Los datos del medio marino son un activo valioso. El acceso rápido a información contrastada, precisa y de calidad es vital para abordar amenazas al medio ambiente marino y al propio entorno habitado por el hombre a lo largo de las costas. También lo es para los estudios y análisis del cambio climático, para el desarrollo de políticas y legislación para proteger las áreas vulnerables de nuestras costas y océanos o para mejorar en la comprensión de las tendencias y en la previsión de cambios futuros.

Hasta no hace mucho, la recopilación, el almacenamiento y el acceso a datos marinos en Europa se han llevado a cabo de manera fragmentada durante muchos años, en la mayoría de los casos a nivel nacional. Para superar estas barreras territoriales y poder tener objetivos más ambiciosos a medio y largo plazo, surgió EMODnet.

Se trata de un importante nodo de información geoespacial marina de múltiples variables temáticas. Desde variables geofísicas, químicas, geológicas, biológicas, etc., abarcando por supuesto, el margen ibérico atlántico. La información está disponible para consulta y descarga, e incluso para uso compartido mediante los servicios web del OGC.

Esta versatilidad lo convierte en una buena herramienta para poder desarrollar modelos matemáticos complejos a partir de la información que aglutina, con capacidad de desarrollar series temporales sin ningún tipo de problema.

Como ejemplo, EMODnet DTM, una herramienta muy utilizada para una amplia gama de aplicaciones en ciencias marinas. Se utiliza como geometría base para los modelos hidrodinámicos, también para estudiar procesos morfológicos en geología o para contribuir a la generación de mapas de hábitats del lecho marino en biología. Estos son sólo alguno de los ejemplos, los más habituales, pero también es utilizado en análisis de sostenibilidad de los océanos y actividades de economía azul, como planificación de infraestructuras submarinas, la ubicación de parques eólicos marinos o la planificación de extensiones portuarias. Todo ello mediante servicios, geoprocesamiento, descargas directas, etc.

Por todo lo anterior, se ha creído oportuno presentar este nodo de información geoespacial marina, como uno de los grandes datasets a nivel regional, aportando algunos ejemplos de su utilidad.

Environmental changes and human interactions during the Holocene: Preliminary results from La Janda palaeolagoon (SW Iberia)

Cristina Val-Peón[1*], José A. López Sáez[2], Juan I. Santisteban[3], Rosa Mediavilla[4], Klaus Reicherter[1]

[1*] Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstrasse 4-20, 52056 Aachen, Germany, c.val-peon@nug.rwth-aachen.de

[2] Centre for Human and Social Sciences, CSIC, C/Albasanz 26-28, 28037 Madrid, Spain.

[3] Dpt. Geodynamics, Stratigraphy and Paleontology, Fac. Geological Sciences, Complutense University of Madrid, C/José Antonio Novais 12, 28040 Madrid, Spain.

[4] Centro Nacional Instituto Geológico y Minero de España (IGME, CSIC). C/Ríos Rosas 23, 28003 Madrid, Spain.

Key words: *palynology, coastal ecosystems, palaeovegetation, archaeology, settlement patterns.*

The Holocene epoch is characterized by several environmental changes and important cultural transformations that have directly contributed to shape landscapes through time. Coastal areas have especially been affected by the interplay of these elements and, as they are highly dynamic areas that have undergone significant changes over time, they may serve as great archives of such transformations. In addition to the complex interaction between these factors and their dynamics, the particularities of certain territories must be considered as a cause of regional expressions, from both an environmental and archaeological perspectives. This is the case of SW Iberia, a key territory of major geoarchaeological interest, as well as a reservoir of biodiversity and a wildlife refuge area. However, from an archaeological point of view, coastal plains are sensitive areas affected by different erosive processes, which may translate in the loss of critical information about human occupations.

In this communication, we present the preliminary palynological data from one sediment core drilled in La Janda palaeolagoon, using the palaeovegetation and archaeological information available to reconstruct past environments and to understand human settlement patterns through different cultural periods of the Holocene.

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Neogloboquadrina pachyderma, indicador de los intervalos fríos registrados en el Golfo de Bizkaia durante los últimos 36.000 años

Zeltia Varela[1*], Ana Pascual[1], Julio Rodríguez-Lázaro[1]

[1] Departamento de Geología, Universidad del País Vasco (UPV/EHU), B. Sarriena, 48940 Leioa, Bizkaia, zeltia.varela@ehu.es

Palabras clave: *final MIS3-MIS1, foraminíferos planctónicos, glacial-estadial, Atlántico central, Eventos Heinrich (HE).*

Los últimos 36000 años engloban el Pleistoceno final y el actual interglacial, el Holoceno. Comprenden el final del Estadio Isotópico Marino MIS3, el MIS2 y el MIS1. Durante el MIS3 y el MIS2, el clima terrestre ha estado supeditado a una serie de oscilaciones climáticas asimétricas de escala milenaria: los Ciclos Dansgaard-Oeschger (D-O) y los Estadiales Heinrich (HSs). Durante los D-O se produjeron rápidos calentamientos seguidos de enfriamientos más paulatinos. Estos ciclos fueron precedidos por los Eventos Heinrich (HE), descargas masivas de icebergs al Atlántico Norte durante los HSs.

En el contexto de una tesis doctoral en la que se caracterizan los principales eventos climáticos de este periodo en la cuenca marina vasca, se han estudiado las asociaciones de foraminíferos planctónicos. En este trabajo se presenta una reconstrucción paleoambiental de dos localizaciones batiales (701 y 2882 m) del Golfo de Bizkaia para el intervalo comprendido desde el final del MIS3 hasta el MIS1. Utilizando como principal bioindicador la especie de foraminífero planctónico *Neogloboquadrina pachyderma* (Ehrenberg) en su variedad de enrollamiento sinistrorso, se detectan los eventos fríos que quedaron registrados en la señal planctónica. Esta especie es un “proxy” muy utilizado para la caracterización de intervalos fríos (glaciales, estadiales), ya que actualmente es dominante en las aguas polares de ambos hemisferios. Sin embargo, en nuestro material, encontramos diferencias sustanciales en la respuesta de esta especie en ambos contextos batiales y en intervalos temporales equivalentes, sobre todo durante el Último Máximo Glacial (LGM). En el contexto más profundo (2882 m), durante el LGM se observa una tendencia ascendente en las abundancias relativas de *Neogloboquadrina pachyderma*, con unos porcentajes que no bajan del 50%, mientras que, en el ambiente más somero (701 m), si bien durante el desarrollo del LGM las abundancias relativas se mantienen en torno al 5%, se produce un descenso abrupto al inicio y un aumento más paulatino al final. Se discuten las posibles causas de estas diferencias considerando la influencia de las distintas corrientes que afectaron a esta región, que han sido caracterizadas por sus contenidos faunísticos y sus propiedades biogeoquímicas.

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Procesos volcánicos recientes en dominios submarinos de las Islas Canarias

Juan-Tomás Vázquez

Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, CSIC, Puerto Pesquero s/n, 29640 Fuengirola, España, juantomas.vazquez@ieo.csic.es

Palabras clave: *volcanismo, hidrotermalismo, monitorización, volcán Tagoro, delta de lava.*

Las islas Canarias han mostrado una importante actividad volcánica en los últimos 10 años con el desarrollo de dos erupciones: una submarina, que dio lugar a la formación del volcán Tagoro en el flanco suroccidental de la isla de El Hierro, entre octubre de 2011 y marzo de 2012, y recientemente otra en la zona emergida de la isla de La Palma (septiembre a diciembre del 2021). La monitorización y los estudios previos, durante y después de las erupciones han puesto de manifiesto la importancia de las Ciencias marinas en la valoración de este geopeligro y su mitigación. La incidencia de la primera sobre los fondos y sistemas medioambientales marinos tuvo gran relevancia, pero la segunda también al producirse la formación de dos deltas de lava sobre la plataforma y el talud submarinos de la isla, que han modificado asimismo su línea de costa. El Instituto Español de Oceanografía ha llevado a cabo la monitorización marina, tanto de los cambios geológicos y biológicos de los fondos marinos como de las modificaciones físico-químicas de la columna de agua. En ambas erupciones se realizaron campañas oceanográficas con el levantamiento de mosaicos batimétricos de alta resolución mediante sondas multihaz (EM710), sonda acústicas de la columna de agua (EK80), muestreo de los materiales presentes tanto en la columna de agua como en los fondos marinos, trabajos de monitorización con roseta oceanográfica de los cambios físico-químicos a partir de diferentes sensores (CTD, contenido en oxígeno, ORP, pH, transitividad de la luz y turbidez, y muestreos de agua a diferentes profundidades. En el caso del volcán Tagoro, el desarrollo de la erupción produjo importantes cambios en el paisaje submarino, con crecimientos y colapsos de conos volcánicos, colapsos de flanco del volcán y de áreas adyacentes y, finalmente, crecimiento fisural; asimismo, se produjeron disminuciones drásticas en el pH y fuertes aumentos en las emisiones de CO_2, SO_4 y Fe. Al finalizar la erupción se pudo, además, analizar la fase de desgasificación y desarrollo de fuentes hidrotermales. En la erupción de La Palma, por otra parte, se monitorizó el cambio de la morfología del fondo marino por el impacto del crecimiento de los deltas de lava generados en la desembocadura de las coladas de lava en el mar, así como los cambios físico-químicos en la columna de agua producidos por los depósitos de ceniza procedentes de las emisiones aéreas.

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Interacción entre procesos sedimentarios gravitacionales y de corrientes de fondo en el Cañón de Algeciras (Margen NE del Estrecho de Gibraltar)

J.T. Vázquez[1*], G. Ercilla[2], D. Casas[2], D. Palomino[1], B. Alonso[2], P. Bárcenas[1], L.M. Fernández-Salas[3], N. López-González[1], M.P. Mata[4], J. Nespereira[5], M.O. Tello[6]

[1*] Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, CSIC, Puerto Pesquero s/n, 29640 Fuengirola, España, juantomas.vazquez@ieo.csic.es
[2] Grupo Márgenes Continentales, Instituto de Ciencias del Mar, CSIC, Passeig Marítim de la Barceloneta 37-49, 08003 Barcelona, España.
[3] Centro Oceanográfico de Cádiz, Instituto Español de Oceanografía, CSIC, Muelle de Levante s/n, 11006 Cádiz, España.
[4] Instituto Geológico y Minero de España, CSIC, Ríos Rosas 23, 28003 Madrid, España.
[5] Escuela Politécnica Superior de Zamora, Universidad de Salamanca, Campus Viriato, Avenida de Requejo 33, 49022 Zamora, España.
[6] Servicios Centrales, Instituto Español de Oceanografía, CSIC, C/ Corazón de María 8, 28002 Madrid, España.

Palabras clave: *geomorfología, cañón de Algeciras, procesos sedimentarios, batimetría multihaz.*

El Cañón de Algeciras se localiza en el eje de una bahía en forma de herradura (Bahía de Algeciras), está excavado sobre un sustrato rocoso (Unidades del Flysch del Campo de Gibraltar) y afectado por la dinámica de intercambio de masas de agua en el Estrecho de Gibraltar. Por sus características geomorfológicas y el contexto oceanográfico en el que se encuentra, este cañón es un excelente ejemplo para comprender mejor los procesos sedimentarios mixtos. Esta zona se ha estudiado en base a un mosaico de batimetría multihaz (EM710) y perfiles del subsuelo con sonda paramétrica (TOPAS PS18). El cañón discurre a lo largo de 19 km de longitud en dirección NNO-SSE, estando constituido por segmentos menores de dirección NNE-SSO, ENE-WSW y NNO-SSE, su anchura varía de 1,2 a 3,6 km y los flancos tienen desniveles comprendidos entre 90 y 560 m. En las paredes del cañón se han caracterizado elementos morfosedimentarios gravitacionales y contorníticos. Los gravitacionales comprenden deslizamientos y cárcavas en las paredes del cañón, así como un *talweg* turbidítico; los contorníticos incluyen parches de sedimentos adosados en sus paredes que localmente llegan a extenderse hasta el *talweg*, así como escarpes y superficies erosivas. La variabilidad espacial de estos elementos indica la coexistencia de procesos gravitacionales y contorníticos en los sectores proximal (cabecera, 60-390 m de profundidad) y medio (390-550 de profundidad), mientras que en el sector distal (550-890 de profundidad) se observa únicamente la acción de procesos gravitacionales. Asimismo, indican una sedimentación contornítica preferencial tanto en el flanco oriental del sector proximal como en el flanco occidental en el sector medio. Estos datos sugieren que el factor de control principal de los procesos mixtos es la interacción entre la propia morfología del cañón y la dinámica de avance y retroceso a lo largo del mismo de las masas de agua Atlántica superficial y la Mediterránea profunda, en función de la marea.

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Crecimiento de deltas de lava sobre los fondos marinos de la parte occidental de la isla de La Palma a lo largo de la erupción del 2021, Islas Canarias

J.T. Vázquez[1*], M. Gómez-Ballesteros[2], O. Sánchez-Guillamón[1], B. Arrese[2], M. García[3], J.A. Lozano-Rodríguez[4], D. Palomino[1], C. Presas-Navarro[4], E. Fraile-Nuez[4]

[1*] Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, CSIC, Puerto Pesquero s/n, 29640 Fuengirola, España, juantomas.vazquez@ieo.csic.es

[2] Servicios Centrales, Instituto Español de Oceanografía, CSIC, Corazón de María 8, 28002 Madrid, España.

[3] Centro Oceanográfico de Cádiz, Instituto Español de Oceanografía, CSIC, Puerto Pesquero s/n, Muelle de Levante, 11006 Cádiz, España.

[4] Centro Oceanográfico de Canarias, Instituto Español de Oceanografía, CSIC, Calle de la Farola 22, 38180 Santa Cruz de Tenerife, España.

Palabras clave: *vulcanismo, deltas de lava, monitorización, La Palma.*

El 19 de septiembre de 2021 comenzó una erupción volcánica en la isla de La Palma. Se formaron importantes coladas de lava que avanzaron desde los centros emisores hacia el oeste a favor de la pendiente de la isla. Estas coladas llegaron a las costas occidentales de la isla el 28 de septiembre a las 23:00 h UTC, que se caracterizan por acantilados de hasta 100 m de altura, y cayeron al mar en varios puntos situados entre la punta de La Bombilla y el puerto de Tazacorte. Se formaron dos deltas de lava, el meridional adosado a la parte norte del delta de lava formado en la erupción de 1949 y el septentrional situado al sur del puerto de Tazacorte. Se han realizado cuatro campañas oceanográficas para controlar los cambios provocados en los fondos marinos por las llegadas de estas coladas de lava, tres durante la erupción y la cuarta una vez esta finalizó. En ellas se adquirieron datos de batimetría multihaz de alta resolución con ecosondas EM710. En primer lugar, se realizó un levantamiento batimétrico en la zona de probable llegada al mar de los flujos de lava para establecer las características de los fondos marinos previas a la erupción y permitir la determinación de los cambios provocados por la llegada de las coladas de lava al fondo marino. El estudio se centró en la parte profunda del emplazamiento de los flujos de lava en la plataforma y talud superior de la isla. Se observó que estos materiales avanzaron por el lecho marino tanto como flujos en bloque (aa) como formando lavas almohadilladas (pahoehoe), ocupando la plataforma insular y rellenando una serie de barrancos submarinos en el talud. La superficie emergida de los deltas de lava meridional y septentrional se extiende respectivamente 43 ha y 5,4 ha. La superficie sumergida estimada es de 30 ha, localizándose nuevos materiales volcánicos hasta una profundidad de 300 m a 1,2 km de la línea de costa inicial. En el interior de los barrancos se han medido hasta 40 m de espesor de acumulaciones lávicas.

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Geomorfología tectónica en el Canal de Mallorca, Promontorio Balear

J.T. Vázquez[1*], O. Sánchez-Guillamón[1], D. Palomino[1], M.C. Fernández-Puga[2], N. Martínez-Carreño[1], P. Bárcenas[1], L.M. Fernández-Salas[3], M.O. Tello[4], M. Gómez-Ballesteros[4]

[1*] Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, CSIC, Puerto Pesquero s/n, 29640 Fuengirola, España, juantomas.vazquez@ieo.csic.es
[2] Departamento de Ciencias de la Tierra, Facultad de Ciencias del Mar y Ambientales, Univ. Cádiz, 11510 Puerto Real.
[3] Centro Oceanográfico de Cádiz, Instituto Español de Oceanografía, CSIC, Muelle de Levante s/n, 11006 Cádiz, España.
[4] Servicios Centrales, Instituto Español de Oceanografía, CSIC, C/ Corazón de María 8, 28002 Madrid, España.

Palabras clave: *geomorfología, tectónica, geofísica de alta resolución, Promontorio Balear*

El objetivo principal de este estudio es la caracterización de los elementos geomorfológicos generados por la tectónica a lo largo del Neógeno y/o Cuaternario en el sector central del Promontorio Balear. Para ello, se ha realizado un estudio geofísico de alta resolución entre las islas de Ibiza y Mallorca adquiriéndose datos de batimetría multihaz (EM710) y perfiles de subsuelo con sonda paramétrica (TOPAS PS18 y PARASOUND P35), en los que se han detectado elementos de distintos tamaños. Los elementos morfológicos de mayor tamaño, que presentan una orientación general NE-SO, son: a) el escarpe tectónico de Emile Baudot; b) el monte submarino de origen volcánico Emile Baudot situado sobre el escarpe de igual nombre y cuya actividad volcánica se ha datado como Cuaternaria; y c) la alineación estructural constituida por los montes submarinos de Ausias March y Ses Olives localizada al este de Ibiza. Los elementos de menor tamaño que deforman las unidades sedimentarias cuaternarias y la superficie del fondo marino son: i) dos elevaciones longitudinales de orientación ENE-OSO, una septentrional situada entre el monte Ses Olives y la isla de Mallorca y otra meridional al sureste del monte Ses Olives, interpretadas como pliegues anticlinales en los perfiles de sonda paramétrica, si bien los pliegues de la elevación septentrional están más cerrados; ii) escarpes de falla normal y depresiones tectónicas (NNE-SSO a NE-SO) deformando la elevación septentrional, y escarpes de falla normal (N-S a NE-SO) en relación con la alineación estructural de Ausias March-Ses Olives; y iii) alineaciones rectilíneas de pockmarks que favorecen la formación de depresiones alargadas y canales (NNO-SSE a NNE-SSO) y se sitúan sobre fallas normales. Los elementos de mayor tamaño responden a la configuración estructural neógeno-cuaternaria del Promontorio Balear. Los terremotos en esta zona son poco numerosos y de magnitud moderada (máxima entre 3,6 y 4), por tanto, los elementos morfo-tectónicos generados en el Cuaternario deben corresponder a procesos de deformación lenta, probablemente en relación con la movilidad de una unidad salina situada en la base de la cobertera Plioceno-Cuaternaria.

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Exploitation patterns of bottom fisheries after the "El Cachucho" MPA management plan implementation

Patricia Verísimo[1*], Augusto Rodríguez-Basalo[1], Ulla Fernández-Arcaya[1], Elvira Ceballos[1], José Rodríguez[1], Marta Ruiz[1], Marta Sainz[1], Francisco Sánchez[1], Antonio Punzón[1]

[1*] Centro Oceanográfico de Santander (COST-IEO), CSIC, C/ Severiano Ballesteros16, 39004 Santander, Cantabria, patricia.verisimo@ieo.es

Key words: *Marine Protected Areas, fishing effort, economic yield, fishing activity, Cantabrian Sea.*

Marine Protected Areas (MPAs) are one of the most effective management tools to achieve marine biodiversity protection and prevent the collapse of fish stocks, leading to sustainable fisheries. The establishment of MPAs increase species abundance, biomass and productivity within their boundaries, but their impact on fishery dynamics remains poorly documented, as there are few estimates of the economic yield of the fishing fleet associated with MPAs.

The aim of the present study is to assess the effect of the implementation of the first offshore MPA declared in Spain, "El Cachucho" (Cantabrian Sea, NE Atlantic), on the exploitation patterns of the main target species of the bottom longline, trawl and gillnets fleet, in terms of fishing effort and landings (kg), and on the economic yield (euros) of the target species of the MPA and its area of influence. For this study, data from the fleet were used, by analysing VMS (Vessel Monitoring System) and logbook data from 2005 to 2020, to describe possible differences in the spatial distribution of these fishing activities.

After the implementation of the MPA, all existing bottom fisheries around Cachucho have disappeared. As a result, the spatial dynamics of this fleet has undergone changes, with increased effort in areas adjacent to the MPA, especially in the fishing grounds located at the southern boundary, where gillnet monkfish effort (*Lophius* spp.) is concentrated, and in the Lastres and Llanes canyons (also south of the MPA), with longline fishery targeting forkbeard (*Phycis blennoides*). Landings composition also showed variations, notably the increased presence of *Molva macrophtalma.*

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Magnetismo ambiental como trazador de impactos antropogénicos en la Ría de Avilés y la Playa de Portazuelos (Asturias, norte de España)

Víctor Villasante-Marcos[1*], Jon Gardoki[2], José Ezequiel Gómez-Arozamena[3], María Jesús Irabien[2], Alejandro Cearreta[2], Ane García-Artola[2], Isabel Emma Quijada[4]

[1*] Laboratorio de Magnetismo de Materiales y Magnetismo Ambiental (L-MAGMA), Instituto Geográfico Nacional, Real Observatorio de Madrid, C/Alfonso XII, 3, 28014 Madrid, España, vvillasante@mitma.es

[2] Dpto. Geología, Universidad del País Vasco UPV/EHU, Apartado 644, 48080 Bilbao, España.

[3] Dpto. Ciencias Médicas y Quirúrgicas, Universidad de Cantabria UC, Avenida Herrera Oria s/n, 39011 Santander, España.

[4] Dpto. Geología, Universidad de Oviedo, C/Jesús Arias de Velasco s/n, 33005 Oviedo, España.

Palabras clave: *Antropoceno, sedimentos estuarinos, beachrock, contaminación.*

La caracterización magnética de un testigo de sedimentos intermareales de la Ría de Avilés (50 cm) y de la secuencia sedimentaria del *beachrock* industrial de la playa de Portazuelos han sido interpretadas junto con datos de abundancia de metales pesados, características sedimentológicas, contenido en foraminíferos bentónicos, radioisótopos de vida corta e información histórica. La ausencia de ^{137}Cs y de $^{210}Pb_{ex}$ indica que todo el testigo es anterior a ~1900 CE. No obstante, su registro se ha podido dividir en tres etapas sucesivas. La más antigua (50-37/40 cm) presenta escaso contenido en ferromagnéticos y una susceptibilidad magnética muy baja, asociada a un elevado porcentaje de arena, bajos niveles de metales pesados (preindustriales) y una asociación de foraminíferos bentónicos que sugiere un ambiente intermareal inferior con influencia marina. Esta etapa es anterior a ~1830 CE, cuando se produjeron las primeras alteraciones significativas de la ría en forma de canalización y desecación de marismas. La segunda etapa (37/40-7 cm; 1830-1860 CE) refleja valores crecientes de susceptibilidad, asociados a un aumento del material fino, contenidos todavía muy bajos de ferromagnéticos, abundancias mayores de metales pesados y un ambiente más confinado (intermareal superior) determinado a partir de su contenido en microfósiles. En esta etapa aparecen partículas esféricas carbonáceas (*SCP*) de origen industrial. La tercera etapa (7-0 cm) comienza aproximadamente en 1860 CE con la canalización general de la ría, mostrando un aumento claro del material ferromagnético (principalmente magnetita), asociado a la presencia creciente de *SCP*s y microesférulas magnéticas del *fly ash* industrial, incremento de metales pesados y un ambiente más confinado entre intermareal superior y marisma baja con su asociación micropaleontológica característica. Por otro lado, en los materiales altamente magnéticos del *beachrock* de Portazuelos, originados a partir de los vertidos al mar de escorias de fundición y cenizas de combustión de la industria siderúrgica de Avilés entre los años 1962 y 1972 CE, predomina la presencia de magnetita y hierro, representando un extremo de magnetismo ambiental completamente industrial.

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Caracterização sismo-estratigráfica das estruturas geológicas presentes nos níveis superiores da plataforma continental do barlavento algarvio (Portugal)

André Vinhas[1*], Aurora Rodrigues[1]

[1*] Instituto Hidrográfico, Rua das Trinas 49, 1249-093 Lisboa, andre.costa@hirografico.pt

***Palavras-chave**: falha de Portimão, tectónica ativa, fundo marinho, base da cobertura sedimentar, Algarve.*

A interpretação de 70 linhas de reflexão sísmica de alta resolução permitiu a realização de uma análise geomorfológica pormenorizada e identificar cerca de 470 estruturas (falhas, dobras e corpos salíferos) presentes na plataforma continental do Algarve (setor cabo S. Vicente-Albufeira). A identificação destas estruturas foi realizada apenas a partir de critérios sismo-estratigráficos: i) interrupção das reflexões internas das unidades sísmicas, ii) rejeitos verticais observados nos dois principais refletores (*Bottom* e BCS – Base da Cobertura Sedimentar).

As estruturas identificadas são na sua maioria potencialmente ativas pois afetam indicadores sismo-estratigráficos que podem ser associados a elementos ou formações com idades inferiores ao Pilo-Quaternário (< 3 M.a.). A grande maioria das estruturas materializam episódios de deformação frágil, sendo marcados por falhas sub-verticais, que apresentam rejeitos verticais variando entre 0,5 m e 17 m. Foram identificadas estruturas compressivas, como dobras e cavalgamento, cuja orientação geral é WSW-ENE a NE-SW e N-S a NW-SE.

As principais estruturas identificadas são as falhas de Portimão (FP) e Alvor (FA). A FP é, notavelmente, o lineamento estrutural mais importante deste setor algarvio, tendo sido possível identificar a sua intensa fracturação em diversas linhas sísmicas. As geometrias dos refletores das unidades sísmicas afetadas, bem como os rejeitos verticais observados nos refletores principais, sugerem que esta falha apresenta uma cinemática nitidamente do tipo *strike-slip* sinistrogira.

Na plataforma algarvia a atividade sísmica parece ser maior no setor a W do canhão de Portimão e junto ao bordo da plataforma, quando comparada com o sector a E do canhão. A localização dos epicentros dos sismos detetados e registados instrumentalmente entre 1961 e 2000 mostram a ocorrência de alguns eventos na zona de influência das falhas do Alvor e Portimão. Os rejeitos verticais observados permitiram estimar uma taxa de movimento vertical mínima na ordem dos 0,12 mm/ano assumindo que o refletor BCS poderá ter sido formado há cerca de 20 000 anos.

A representação cartográfica dos elementos identificados permitiu constatar o forte condicionalismo estrutural deste setor da margem portuguesa e a necessidade de pormenorizar algumas das estruturas identificadas, dado o seu potencial sismogénico.

Human impacts on the Northern Iberian Coast: Brominated pollutants

Lucía Viñas[1*], Begoña Pérez-Fernández[1], Inmaculada Alves[1], Rebeca Ruiz[1]

[1*] Centro Oceanográfico de Vigo, Centro Nacional Instituto Español de Oceanografía (CNIEO-CSIC), Vigo, Spain, lucia.vinas@ieo.csic.es

Palabras clave: *flame retardants, marine sediments.*

Plastic and textile products as well as electronical devices are easily flammable products and to reduce fire-related injury and property damage, such materials are commonly covered by the so-called flame retardants (FR). The brominated flame retardants (BFRs) are the largest market group because of their low cost and high-performance efficiency. Nevertheless, as these compounds are additive rather than chemically bound to the products, they can be released into the environment and because they are toxic and persistent organic chemicals and can bioaccumulate, they have become contaminants of concern detectable in the environment, in animals, and in humans. PBDEs (Polybrominated Diphenyl Ethers) are a group of 209 different congeners used as FR and since 2004 banned in the EU. In spite of banned and restriction such chemicals are still detected in the environment and their monitoring necessary.

In 2016 a sampling campaign was carried out covering the North Spanish Atlantic coast from the border with Portugal to the limit with France. The collected sediments were studied to determine sediment characteristics and PBDEs concentrations. Sedimentological characteristics including grain size distribution and total organic content were measured. Gas chromatography coupled to MS detector was used to perform the analytical analysis under QA/QC to guarantee the quality of the results. BDE28, BDE47, BDE66, BDE85, BDE99, BD100, BD153, BDE154 andBD183 have been determined and evaluated against Background assessment criteria (BACs) and Federal Environmental Quality Guidelines (FEQGs). Levels found demonstrate that there is still detectable presence of PBDEs in marine sediments albeit they are well below the FEQG and even frequently below BACs.

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Distribution of persistent organic pollutants in the Gulf of Biscay and Galicia: Polycyclic Aromatic Hydrocarbons (PAHs)

Lucía Viñas[1*], Begoña Pérez-Fernández[1], Jesica Bargiela[1]

[1*] Centro Oceanográfico de Vigo, Centro Nacional Instituto Español de Oceanografía (CNIEO-CISC), Vigo, Spain, lucia.vinas@ieo.csic.es

Palabras clave: *Marine sediment, marine pollution, hydrocarbons.*

Polycyclic aromatic hydrocarbons (PAHs) are produced as a result of fires or combustion processes and are also natural components of coal and oil. Due to their persistence, potential to bioaccumulate and toxicity, the analysis of PAHs in sediment and shellfish is required for the MSFD and Regional Sea Conventions; including, at least, the determination of the concentrations of phenanthrene, anthracene, fluoranthene, pyrene, benz[a]anthracene, chrysene, benzo[a]pyrene, benzo[g,h,i]perylene and indeno[123-c,d]pyrene.

In order to control the level of PAHs in the Iberian Northern platform, a sampling campaign (from the Portugal border to the border with France) was performed in which 69 marine surficial sediment samples were collected in 2016. Organic carbon and particle size analysis were performed to complete the sediments characterization and facilitate data interpretation. The PAH analysis included a first step of PLE Pressurized Liquid Extraction (PLE), followed by a cleaning up of the extract and the quantification of 35 parent and alkylated PAHs was performed by gas chromatography-mass spectrometry.

The obtained results revealed a higher presence of PAHs in the Eastern stations. In the absence of other sediment quality guidelines (SQG) polycyclic aromatic hydrocarbon concentrations in sediment were assessed against Effects Range-Low values, developed by the United States Environmental Protection Agency to assess the ecological significance of PAH concentrations in sediment. The determined concentrations indicated a presence of some stations with concentrations that exceeded the respective ERL indicating the possible biological toxicity of some sediments.

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First data of the PAHs along a sediment core from Ria de Vigo

Lucía Viñas[1*], Begoña Pérez-Fernández[1], Ana V. Filgueiras[1], Jesica Bargiela[1]

[1*] Centro Oceanográfico de Vigo, Centro Nacional Instituto Español de Oceanografía (CNIEO-CSIC), Vigo, Spain, lucia.vinas@ieo.csic.es

Key words: *hydrocarbons, marine sediment.*

Sediment cores can inform about the temporal trend of pollutants in an environment. Different sediment layers, settled at different times represent the pollution in that moment. A sediment core in the inner part of the Ría de Vigo was collected and some layers analysed in order to determine the temporal trend of PAHs in the last decades.

PAHs can have a natural (biogenic) and anthropogenic origin but generally the last one is the predominant. The main sources of PAHs to the environment are petroleum and coal combustions as well as fires or even the use of pitch or other petroleum products. In this study 35 individual PAHs were analysed (including parent and alkylated ones) as well as some groups of alkylated PAHs. A QA/QC is put in place to guarantee the quality of the analysis-

The sum of 16 EPA PAHs was in the range of 200-1000 µg/kg d.w. with a clear increase in the values in the more recent layers pointing at the anthropogenic activity as one of the main drivers of the PAH concentrations in sediments. The values are in the range of other estuarine areas with values above the reference values (background) but generally below the ERL and so not expected to be causing adverse biological effects. The study of the isomeric ratios of PAHs show that the origin has not changed during the period studied and it is mainly petroleum combustion mixed with different types of combustion.

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Presence of banned chlorinated pollutants in sediments of the Northern Iberian Coast

Lucía Viñas[1*], Begoña Pérez-Fernández[1], José Antonio Soriano[1]

[1*] Centro Oceanográfico de Vigo, Centro Nacional Instituto Español de Oceanografía (CNIEO-CSIC), Vigo, Spain, lucia.vinas@ieo.csic.es

Key words: *PCBs, marine sediment.*

Polychlorinated biphenyls (PCBs) are industrial chemical compounds that were banned in the mid-1970s owing to concerns about their toxicity, persistence and potential to bioaccumulate in the environment. However, despite European and global action, releases continue through diffuse emissions to air and water and PCBs concentrations are still detected in environmental matrices. In the framework of the Regional Sea Conventions such as OSPAR or Barcelona Convention, it is proposed to monitor the concentrations of pollutants that include, at least, the following PCBs: CB 28, 52, 101, 118, 138, 153 and 180.

A control of the described PCBs presence was performed in a set of more than 70 surficial marine sediment samples distributed in the Gulf of Biscay/Atlantic coastal area. The analysis includes an accelerated solvent extraction step (ASE) followed by detection in a gas chromatography coupled to ECD detector. The analysis was under QA/QC to guarantee the quality of the results.

The results indicate a detectable presence of PCBs pointing out higher concentration in eastern stations. Background Assessment Concentration (BACs) and Environmental Assessment Criteria (EAC) are assessment criteria that in place for polychlorinated biphenyls (PCBs) in sediment and they were used to evaluate the concentrations found. Most of the sediments have concentrations close to or even smaller than the BACs but in some specific sediments the concentration of some of the PCBs exceeds the EAC indicating possible toxic effects.

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Slope stability of the Guadiaro-Baños contourite drifts (SW Mediterranean)

Mariano Yenes[1]*, David Casas[2], José Nespereira[1], Nieves López-González[3], Daniele Casalbore[4], Serafín Monterrubio[1], Belén Alonso[2], Gemma Ercilla[2], Carmen Juan[5], Patricia Bárcenas[3], Desiré Palomino[3], Pilar Mata[6], Juan Tomás Vázquez[3], Ferran Estrada[2], María Azpiroz-Zabala[7], Manuel Teixeira[8]

[1] Departamento de Geología, Universidad de Salamanca, 37008 Salamanca, Spain, myo@usal.es
[2] Institut de Ciències del Mar (ICM-CSIC), Passeig Marítim de la Barceloneta 37-49, 08003 Barcelona, Spain.
[3] Instituto Español de Oceanografía (IEO-CSIC), Centro Oceanográfico de Málaga, Puerto Pesquero s/n, 29640 Fuengirola, Málaga, Spain.
[4] Dipartimento Scienze della Terra, Università Sapienza di Roma, Piazzale Aldo Moro 5, 00185 Rome, Italy.
[5] Instituto Español de Oceanografía (IEO-CSIC), Centro Oceanográfico de Cádiz, Puerto Pesquero, Muelle de Levante s/n, 11006 Cádiz, Spain.
[6] Instituto Geológico y Minero de España (IGME-CSIC), Ríos Rosas 23, 28003 Madrid, Spain.
[7] Arquimea Research Center, Edificio Nanotec, Parque Industrial Las Mantecas, 38320 San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain.
[8] Instituto Dom Luíz, Faculdade de Ciências da Universidade de Lisboa, Edifício C1, Campo Grande, 1749-016 Lisbon, Portugal.

Key words: *Submarine landslide, Alboran Sea, Sedimentology, In-situ geotechnical tests (CPTu), Factor of Safety (FoS).*

Large Quaternary plastered drifts characterise the slope and base of slope of the area between the Guadiaro and Baños turbidite systems (Alboran Sea). A terraced contourite drift has developed between 190 and 600 meters water depth (mwd). Seawards, another plastered drift extends from a scarp at 600 mwd to beyond the base of slope.

The sedimentary and physical properties of the contourite drifts allowed establishing a geotechnical model that reveals high factors of safety. The sediments evolve from granular, low plasticity and very poorly sorted on the contourite terrace to medium- to high-plasticity, low-permeability and poorly sorted silty clayey-sediments on the distal contourites at the base of slope. These characteristics are consistent with the geotechnical model defined by the *in-situ* properties and SBT (Soil Behaviour Types) classification. The coarse-grained sediments, are defined by cohesion (c′) and internal friction angle (ϕ′) values of 0-9 kPa and 46-30º, respectively. The undrained shear strength gradient (∇Su) is 2 kPa/m for distal contourites. These properties allow assessing high factors of safety (FoS), for all the scenarios considered, including seismic loading. Several characteristics and processes may explain the high stability compared to others with similar sedimentary features. These include 1) the geometry of the drifts, defined by an upper contouritic terrace and low-mounded cross-sections; and 2) recurrent low intensity earthquakes and cyclic loading induced by internal waves, both favouring the dynamic compaction.

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