**Proceedings of EWTEC 2021**

The 14th European Wave and Tidal Energy Conference was held from 5-9 September 2021 at the University of Plymouth. For the first time, in response to the global pandemic, EWTEC was held in a hybrid format, allowing attendees to present online as well as in person. There were 12 different thematic tracks:

- Wave resource characterization
- Wave hydrodynamic modelling
- Wave device development and testing
- Tidal resource characterization
- Tidal hydrodynamic modelling
- Tidal device development and testing
- Structural mechanics: materials, fatigue, loadings
- Station-keeping, moorings and foundations
- Operations and maintenance
- Grid integration, power take-off and control
- Environmental impact and appraisal
- Economical, social, legal and political aspects of ocean energy

From the 403 abstracts initially submitted, 236 full papers were finally selected by a peer-review process, during which 48 Track Directors requested 963 single blind reviews and 427 reviews were finally carried out. These papers comprise the present proceedings, totalling 1952 pages.

This USB flash drive contains the searchable conference proceedings.

On behalf of the EWTEC Committee, I would like once again to warmly thank all the reviewers and Track Directors for their essential and voluntary work, and all authors for their contribution to the scientific content of the 14th EWTEC.

I would also like to sincerely thank our Sponsors for their valuable support to the conference.

**Professor Deborah Greaves**

Chair of EWTEC 2021

1 September 2021


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Compiled by Dr. Luke Blunden (Energy and Climate Change Division at the University of Southampton)

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# BEMRosetta: An open-source hydrodynamic coefficients converter and viewer integrated with Nemoh and FOAMM

Iñaki Zabala, Yerai Peña-Sanchez, Thomas Kelly, João C. C. Henriques, Markel Penalba, Nicolás Faedo, John V. Ringwood and Jesús M. Blanco

***Abstract*—Boundary Element Method (BEM) solvers are extensively used to obtain the hydrodynamic coefficients required to model hydrodynamic forces in floating marine structures. BEM solvers require the discretization of the submerged device surface as a mesh to compute the hydrodynamic coefficients as radiation damping and added mass, response amplitude operators and linear and second-order exciting forces. Each of these solvers need particular input files and mesh formats, and save the results in specific file formats. Typically, the input and output files are incompatible between different solvers. Researchers handle this problem by converting model results through homemade spreadsheets or macros made in scripting languages. BEMRosetta was created to allow loading and saving the input files, mesh geometries and the hydrodynamic coefficients, in different formats. Furthermore, it also includes a mesh viewer. Additionally, BEMRosetta can calculate different parameters from the mesh and the hydrodynamic coefficients. Through its integration with the Finite-Order hydrodynamic Approximation by Moment-Matching (FOAMM) toolbox, BEMRossetta allows the state-space model of the radiation convolution term for the desired degrees of freedom be obtained.**

***Index Terms*—BEM, Nemoh, FOAMM, Capytaine, HAMS.**

## I. Introduction

FLOATING marine devices such as ships, offshore wind platforms or wave energy converters are usually modelled using hydrodynamic coefficients obtained from potential flow BEM solvers. Based on these frequency domain coefficients comprising added mass, radiation damping and excitation forces, frequency domain, or normally time domain simulations can be created to estimate the dynamic loads and power output for the marine energy converters in question. All the solvers are made by different companies and open source projects and use different formats for a) the geometry mesh definition, b) the BEM case definition including, for example, the set of frequencies, wave headings, water depth, degrees of freedom to do the calculation, and c) to set the hydrodynamic coefficients (Fig. 1).

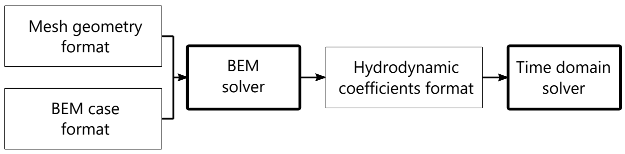


Fig. 1: Basic outline of the BEM related section of the floating body simulation workflow.

These different file formats make it difficult to share cases and results between research groups, and limit the use of some formats that are less supported than other formats.

Expert programmers solve this problem by implementing filters and conversion routines with reduced error checking and sometimes low re-usability. Because of this, researchers with limited programming skills or economic resources to access software licenses, may not be able to convert the results obtained from open-source codes, like Nemoh [1], Capytaine [2] or HAMS [3], into the specific formats required by other software.

BEMRosetta is a software tool designed to solve these drawbacks, allowing easy sharing of files between researchers and using as much as possible open source tools for the workflow of developers without economic resources. It includes an intuitive, window-based user interface that allows the use of its features in an agile way and without programming knowledge. Using the built-in graphics viewer, BEMRosetta allows for the visual comparison between the results obtained with different software packages, as well as the results obtained with the same software but with different discretization levels. Additionally, BEMRosetta can calculate the infinite frequency added mass, the impulse response function of the radiation force, and a wide set of geometric parameters like the hydrodynamic stiffness matrix, submerged volume and centre of buoyancy. BEMRosetta also includes a wizard for handling Nemoh, which eases the use of such BEM solver, especially for beginners.

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