# TOWARDS HIGH PERFORMANCE LINEAR POTENTIAL FLOW SIMULATIONS

## M. ANCELLIN[1]

*matthieu.ancellin@eurobios.com*

[1] Eurobios Scientific Computing Branch, Cachan, France

## Summary

Linear potential flows simulated with the Boundary Elements Method (BEM) are ubiquitous in marine engineering. It is one of the cheapest model available for the interaction between wave and floating bodies. Nonetheless, some simulations might still be too expensive to run, for instance the interaction between a large number of floating bodies. Besides, most open-source solvers are still much slower than their commercial counterparts.

This talk is dedicated to the current effort done to improve the precision and the performance of the code Capytaine (https://github.com/mancellin/capytaine). This open-source BEM solver is derived from Nemoh and written in Python+Fortran. Its development started in 2017 and since 2022, it is supported by the National Renewable Energy Laboratory (NREL) of the US Department of Energy.

After recalling the theory behind linear potential flow and the BEM, the main performance costs of the resolution will be identified. The H-matrices (Hierarchical matrices) technique has been implemented to reduce the cost of the resolution by solving only approximately the interaction between distant panels. Application to arrays of wave energy converters will be presented. Other approaches to limit the cost of the simulation will be discussed, such as the use of symmetries or the current parallelization strategy of the code. Finally, some perspectives on future possible ways to accelerate the code will be drawn.