A FLUID-STRUCTURE INTERACTION ALGORITHM FOR SHIP HYDROELASTICITY

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Keywords: *fluid-structure-interation, marine hydrodynamics, waves*

Ships operating in the sea experience routine loading due to the interaction with ambient waves, and intermittent loading due to encounters with large waves that lead to slamming-type events. The focus of the presentaiton is the development of a numerical algorithm that is suitable for the prediction of the loads on a ship that encounters extreme loads due to both slamming and wave bending. Specifically, a two-way coupled fluid-structure algorithm is developed that combines a fully nonlinear viscous hydrodynamics solver with a linear dynamic finite element solver. The algorithm includes a generalized mapping capability to exchange information between the fluids and structures domains. The fluid solver is based on the OpenFOAM open source library, and has the capability to generate a wide range of sea conditions. The structural solver utilizes a modal decomposition of the structure to exploit modal truncation and which provides valuable computational savings. The presentation will include validation examples that range for canonical problems to real ship models in large seas.

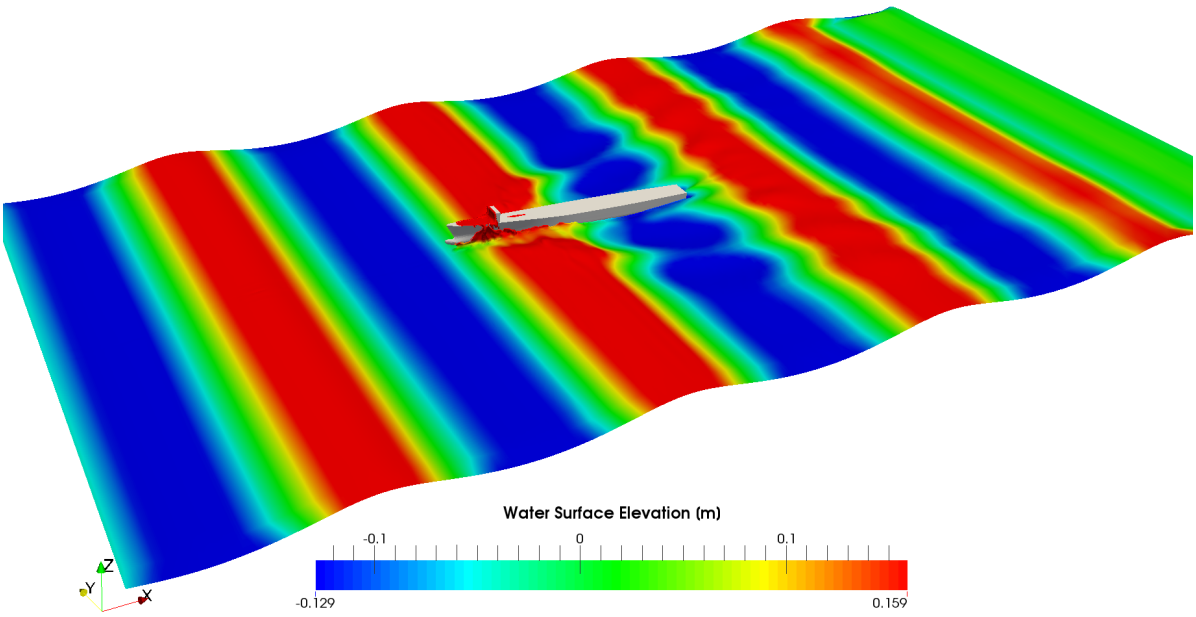

Figure 1: The JHSS Moving in an steep regular wave