

Title: 2D+t potential model for the hydrodynamics of an advancing fuselage

The hydrodynamics of a fuselage model moving in water with a constant horizontal velocity and a fixed pitch angle is here simulated by a 2D+t fully non-linear potential model. The 2D+t approach is based on a slender body approximation and reduces the 3D problem in a 2D cross section problem, shape of which changes in time, that takes in an earth-fixed plane orthogonal to the advanced velocity. Due to the curvature in the rear part of the advancing fuselage, which causes the cross section to narrow and the lowest point of the contour to rise, the problem first manifests in the transversal plane as a water entry of a body followed by a water exit phase. The 2D problem is faced in the framework of the potential theory and is formulated in terms of boundary-element representation of the velocity potential: the time evolution is described by a mixed Eulerian-Lagrangian approach. The problem is solved numerically via a hybrid BEM-FEM approach through the use of a Boundary Element Method coupled with a simplified Finite Element Method adopted for modelling the thin jet which rises along the body contour. Comparison with experimental data obtained within the H2020-SARAH european project and other numerical results will be presented for validation. Although the approach is used here for a fuselage model, it can be also useful and reliable for analysing the hydrodynamics of ships.

Keywords: 2D+t, Potential Flow, Water entry-exit