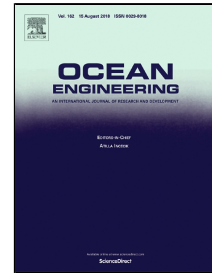


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International Benchmark Study on Numerical Simulation Methods for Prediction of Manoeuvrability of Ships in Waves

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**International Benchmark Study on Numerical Simulation Methods  
for Prediction of Manoeuvrability of Ships in Waves**

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**ABSTRACT**

The paper summarizes the results of the SHOPERA international benchmark study of numerical methods for the prediction of time-average wave-induced forces and manoeuvres of ships in waves. These topics are of paramount importance for both the scientific community and the maritime industry in view of the recently introduced international regulations concerning manoeuvrability of ships in adverse conditions. Benchmarked numerical methods, ranging from semi-empirical formulae and potential flow methods to Reynolds-averaged Navier-Stokes solvers, were applied in a comparative way to a series of specified test cases and compared with experimental data to conclude on the present international state of the art in the study field. Whereas several numerical methods could predict accurately the time-average wave-induced forces, none of them provided sufficiently accurate results throughout all test cases, thus their application in design and approval needs validation in each individual case. Regarding direct numerical simulations of manoeuvres in waves, the study showed their immature state for practical design and approval. These outcomes, attributed to a great extent to the complexity of the problem and specifications both for numerical simulations and model tests, necessitate additional numerical and experimental studies to clarify identified critical issues and thus improve the capability of numerical tools.

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