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Performance prediction of the DTMB 5415 model in irregular waves via URANS simulations

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Simulation-based methodologies are widely used for the design of marine vehicles to alleviate the costs of the traditional build-and-test approach. Within this context, high-fidelity simulations are required to accurately predict and possibly optimize the performance of naval vehicles. The objective of the present work is the prediction of resistance and motions of a destroyer-type hull, namely the DTMB 5415, in irregular head waves. A significant condition of sea state 5 and Froude number 0.3 (equal to 22kn for the full scale model) is considered. The performance is evaluated using both irregular waves simulation and stochastic multiple regular wave simulations with metamodel. Specifically, the expected value of the mean total resistance and the significant single amplitude of pitch, vertical acceleration at the bridge, and vertical velocity at the flight deck are evaluated, as prescribed by the NATO STANAG 4154, and unsteady RANS solver is used for the analysis. This activity is partially conducted within NATO Task Group AVT-252 addressing the “Stochastic Design Optimization of Naval and Aero Military Vehicles”.

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