Underwater Radiated Noise prediction of a navy vessel using a hybrid method

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This study aims to predict the Underwater Radiated Noise (URN) of an ORCA-class training vessel of the Royal Canadian Navy (RCN) in full-scale using a viscous flow-based hybrid method. In the numerical calculations, Delayed Detached Eddy Simulation (DDES) method together with the porous formulation of the Ffowcs Williams Hawkings Equation (P-FWH), are utilised to predict the URN both in near and far fields. The hydrodynamic and hydroacoustic pressures are compared in the near field to show the accuracy of the predictions for the far field predictions. In the numerical calculations, the hydrophones are deployed in the far field where the URN measurements are conducted. The predictions are compared with the measurements up to 1kHz at various speeds. The results show that the URN generated by the flow around the hull and propeller is underpredicted against the measurements at 5 knots. This is because the propeller is not the dominant noise source at the lowest speed where other noise sources within the ship (e.g., machinery, hull radiation etc.) also contribute to the ship's signature. However, the numerical predictions and measurements show good agreement at 13 knots, where the propeller is the dominant noise source compared to the other noise sources of the ship.

Key words: CFD, DES, FWH, URN