Abstract Submitted
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The Propeller-Induced Cavitation Noise Source: Experimental Measurements and Numerical Solutions[1] DUNCAN MCINTYRE, MOSTAFA RAHIMPOUR, University of Victoria, GIORGIO TANI, FABIANA MIGLIANTI, MICHELE VIVIANI, University of Genoa, ZUOMIN DONG, PETER OSHKAI, University of Victoria — Propeller-induced cavitation dominates the mid- to high-frequency range of underwater radiated noise emitted by ships, representing a significant threat to marine ecosystems. The development of mitigation strategies for noise pollution requires predictive models, which are challenging to develop due to the varied, multiscale, and multi-physical nature of the phenomenon. One promising technique for predicting the detailed behaviour of the propeller cavitation noise relies on the use of uRANS solutions of the cavitating flow with a volume-of-fluid cavitation model as an input for acoustic modelling with a porous surface formulation of the Ffwocs Williams-Hawking analogy. We present an application of this methodology involving the reproduction of model-scale experiments in a cavitation tunnel. We focused on ten loading conditions of a controllable pitch propeller that resulted in four distinct regimes of cavitation. Performance of the hydrodynamic model varied depending on the c avitation regime. Cavities attached to propeller blades well, but regimes involving cavities within shed vortices were not reproduced well. The numerical model was effective in predicting the shapes of acoustic spectra, but the absolute sound levels were overpredicted.

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