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Marine Propeller Analysis with an Immersed Boundary LES methodology[1] SETH SCHROEDER, Naval Surface Warfare Center Carderock Division, ELIAS BALARAS, The George Washington University — Modern marine propeller design and analysis techniques employ a wide range of computational methods to balance time constraints and accuracy requirements. Potential flow and RANS based methods have historically comprised the tools necessary for design and global performance analysis. However, for analysis where unsteady flow phenomena are of interest, eddy resolving methodologies are required. In the present study we use the large-eddy simulation (LES) approach coupled with an immersed-boundary (IB) method to perform computations of the flow around a rotating propeller at laboratory Reynolds numbers. Compared to classical boundary conforming strategies our formulation eliminates meshing overhead time and allows for body motion without additional treatments such as overset or dynamic meshing. The structured Cartesian grid also allows for a non-dissipative solver which conserves mass, momentum and energy. We will focus on the Italian Ship Model Basin (INSEAN) E1619 propeller and compare the predictions of our method to experimental results. The E1619 propeller is a 7-bladed submarine stock propeller that has been the subject of extensive experimental testing and previous computational studies.

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