Abstract Submitted
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Large-eddy simulation of a submarine propeller downstream of a rudder[1] ANTONIO POSA, RICCARDO BROGLIA, CNR-INM Institute of Marine Engineering, National Research Council of Italy, ELIAS BALARAS, Department of Mechanical and Aerospace Engineering, George Washington University — The influence of an upstream rudder on the wake properties of a submarine propeller is investigated using Large-Eddy Simulation and an Immersed-Boundary method. The flow problem is simulated using a cylindrical grid composed of about 1.7 billion nodes. Earlier computations of the isolated propeller (open-water condition) demonstrated the accuracy of the overall methodology, via comparisons with both dynamometric measurements and Particle Imaging Velocimetry (PIV) visualizations. Three incidence conditions of the rudder are considered, corresponding to 0^o, 10^o and 20^o. Comparisons with the results in open-water conditions demonstrate that in the near wake the topology of the typical coherent structures shed by submarine propellers (tip and hub vortices) is not modified by the presence of the upstream hydrofoil at small incidence angles. In contrast, levels of turbulence within the wake are dramatically increased in the last configuration, featuring the rudder at 20^o of incidence. This substantial change is triggered by the separation occurring on the suction side of the hydrofoil, leading to a significant perturbation of the inflow conditions of the propeller.

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