Abstract Submitted
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Large-eddy simulations of a fully appended submarine model[1] ANTONIO POSA, ELIAS BALARAS, The George Washington University — In the present study we report large-eddy simulations (LES) the flow around an idealized submarine geometry (DARPA SUBOFF) at a Reynolds number -based on the model length and free stream velocity- equal to 1.2 million. A finite-difference formulation on a cylindrical coordinate grid of 2.8 billion nodes is utilized, and boundary conditions on the submarine model are imposed using an immersed-boundary technique. The boundary layers are "tripped" near the leading edge to mimic the conditions in experiments reported in the literature. Our computations resolve the detailed dynamics of the turbulent boundary layers on the suboff body as well as their interaction with the large scale vortices generated at the sail and fin junctions. The time-averaged velocity profiles in the intermediate wake reach self-similarity, except for the region affected by the wake of the sail. The comparison with the exponential law from the experimental study in the literature is satisfactory. It is also confirmed that the flow coming from the fins causes a deviation from the self-similar profile, which is more evident than in the experiments. Details on the turbulent boundary layer on the surface of the body will be provided, showing a good qualitative agreement with the results in the literature.

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