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ABSTRACT

The use of underwater vehicles, not only for military but also for exploration, scientific and industrial purposes, is increasing, leading to higher demands on the designing of such vehicle types. For an underwater vehicle, the appropriate evaluation of its manoeuvrability characteristic is of crucial importance to guarantee its function within design parameters and safe operation. In a previous work carried out by the authors, the ability of numerical methods to reliably evaluate the manoeuvring forces experienced by the well-known DARPA-SUBOFF submarine (Roddy, 1990) was explored for a wide range of kinematic conditions. The same conditions explored by the experimental activities were simulated using an open-source RANS solver to calculate the hydrodynamic forces and moments. Unexpectedly, despite the results showing a good agreement with the experimental data for the fully appended configuration (the most relevant from a design point of view), for the barehull configuration the results show significant discrepancies (Zheku *et al.*, 2023). In the current study possible causes of these differences are investigated. The findings show that this issue arises from an underprediction of the effect of the shaded longitudinal vortexes in the suction side of the submarine. This discrepancy, even if it is quite small, affecting a large portion of the body, generates a not negligible error on the lateral force and its position. This consideration assesses the necessity for high-fidelity solvers to better predict these mall flow features to be able to correctly evaluate the maneuvering force of a slender body.

REFERENCES

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