XI International Conference on Computational Methods in Marine Engineering

Cavitation prediction in high performance sailing, one year later.

David de Prémorel[1,*], Pierre Robin[1], Alban Leroyer[2] and Jeroen Wackers[2]

[1] finot-conq architectes navals, 12bis allée Loic Caradec, 56000 Vannes, France.

[2] Nantes Université, École Centrale Nantes, CNRS, LHEEA, UMR 6598, F-44000 Nantes, France.

[*] dpremorel@finot-conq.com

ABSTRACT

In July of 2024, we presented our perspective on the modelling of cavitation from the industry's point of view at the 35th SNH. We explained how cavitation prediction (Legagneux et al., 2023; Perali et al., 2024) was a major need for the accurate modelling of high performance yachts. In particular, we used the example of IMOCA yachts (Fig. 1), where hydrofoil cavitation has a major influence on the longitudinal stability of the boat.

Figure 1: An IMOCA designed by finot-conq in association with Antoine Koch and GSea Design.

While we showed that 2D RANSE cavitation calculations were possible and indeed used in the design cycle of our last IMOCAs, we also explained why the computational cost of 3D RANSE cavitation modelling was currently too high for an industrial project. Consequently, last year's presentation introduced a test case for a cavitating foil, but contained no calculation results.

In this presentation, we will show the results of calculations on the same test case (Fig. 2), with parametric variations on numerical parameters such as y+, time steps, non-linear iterations, cavitation parameters…

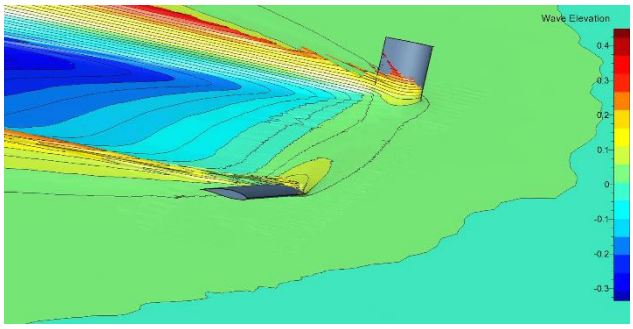

Figure 2: RANSE calculation of the hydrofoil test case.

We will discuss these results in light of the naval architect's needs, which are on a different time scale as the modelling itself, and explore some possible improvements.

References

L. Legagneux, M. Van Den Boogaard, B. Mallol. Improved accuracy in cavitating flows using adaptive grid refinement. In Proceedings of Xth International Conference on Computational Methods in Marine Engineering, 2023.

P. Perali, F. Hauville, A. Leroyer, J-A. Astolfi, M. Visonneau. Experimental and Numerical Study of the Flow Around Rigid and Flexible Hydrofoils for Wetted and Cavitating Flow Conditions. Journal of Fluids Engineering, 146:(11):1-64, 2024. doi: 10.1115/1.4065296.