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Actuator Line Simulations of a Foiling Boat

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ABSTRACT

Foiling boats are becoming ever more popular, yet the use of numerical design tools and the relevance of their respective limitations are still a topic of discussion. Actuator Lines are being used successfully to model slender bodies like wind and tidal turbine blades and can be expected to capture the wake interaction between hydrofoils well. However, hydrofoils operate in surface proximity and the related loss in lift and increase in drag poses a complex problem. This project explores the use and limitations of the ALFEA toolbox [1] for the design of a foiling boat.

First comparisons against experimental data from [2] indicate that free surface effects are captured implicitly due to the changing flowfield and related changes in angle of attack 1. This might seem surprising since the AL method itself does not contain any physical model of the free surface.

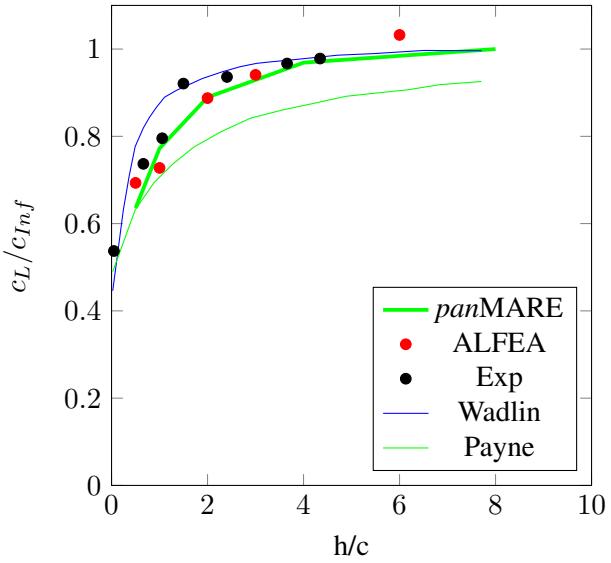

Figure 1: Normalised coefficient of lift over submergence depth

This paper presents a validation of simulation results for a scaled foiling boat model developed and field tested at QUB and explores hull-foil and free-surface foil interactions.

References

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