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FOREWORD

Foreword to special issue in Ship Hydrodynamics

Ignazio Maria Viola[1]

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Ship hydrodynamics is one of the oldest fields of research of all times; its knowledge has been one of the key enablers of social and cultural development through explorations and trading. Today, nine tenth of world trade is carried by ships; therefore, shipping is a major global consumer of energy and producer of carbon emissions. Enhancing performance, safety and capabilities is imperative to ensure a fast transition to a sustainable use of our oceans, seas, and water ways.

This Special Issue brings together some exceptional novel contributions to the field of ship hydrodynamics, each leveraging on recent advances in computational methods to address critical research questions. Advances in artificial intelligence (artificial neural networks) and data-driven model order reduction (dynamic mode decomposition) underpins the internationally co-authored works on ship manoeuvring of Diez et al. and D'Agostino et al., respectively.

Ship manoeuvring is also the focus of the work of Oud and Bedos, who investigate whether state-of-the-art Reynolds-averaged Navier–Stokes (RANS) simulations accurately predict ship manoeuvring when the complexity of the underlying physics is further complicated by shallow water condition. Instead of near the seabed, Toxopeus et al. consider bodies near the free-surface, and yet underwater. This is the case of submarine at periscope depth, including manoeuvring.

Advances in ship hydrodynamics are often made at the boundaries with other research areas, such as fluid–structure interaction in the case of Eskilsson and Palm. The authors model a moored floating body by coupling RANS with a wave body-mooring model.

In contrast to the complex multi-physics simulations of Eskilsson and Palm, Hino et al. have focussed on enhancing the underlying RANS flow prediction that underpins all of the above-mentioned works. The authors investigate a modified K–ω SST turbulence model to improve the prediction of the flow around curved surfaces with pressure gradients, and thus, for example, to enhance ship resistance prediction.

Eça et al. use RANS simulations to gain new fundamental understanding of ship resistance correlation lines and scaling laws. They specifically focus on the contribution of roughness effects, which is a topic of increased significance for its implication on fuel consumption and carbon emissions, and yet with so much still to be understood.

Troll et al. use detached eddy simulations to investigate the vortex dynamics of bio-inspired rudders with leading-edge tubercles. This work reminds us the opportunities arising from learning from nature rather than exploiting nature.

Finally, the paper of Raven provides precious insights and lesson learned from the career in ship hydrodynamics of one of the Masters of this discipline.

I have been honoured to help bringing together these excellent contributions to the field of ship hydrodynamics, a research field with as much history, as future.

This Special Issue includes selected papers of the 9th Conference on Computational Methods in Marine Engineering (Marine 2021), which was held between 2nd and the 4th June 2021.

✉ Ignazio Maria Viola
I.M.Viola@ed.ac.uk

[1] School of Engineering, Institute for Energy Systems, University of Edinburgh, Edinburgh, UK

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