Master thesis project:

CFD investigation of wind powered ships under extreme condition

Background

Wind powered ships could be a feasible way to reduce the fossil fuel emission from shipping. In an ongoing research project, Wallenius Marine in cooperation with SSPA, KTH and Chalmers, a wind powered car carrier concept is being developed. The sails of this concept are planned to be very large rigid wings. Under normal operation, the flow over the wings will be attached. In some extreme situations, however, the wings may have such large angle of attack that the flow is partly or completely de-attached (stalled). A situation like that can potentially lead to large unsteady forces which may be harmful to the ship in terms of structural integrity and risk of capsizing.

Objective and method

In this project, the task is to investigate these types of conditions using CFD. As the flow is largely separated, unsteady scale-resolving simulations needs to be performed, using a DES-type simulation methodology. Simulations will be performed in OpenFOAM. The goal is to study the most severe conditions and describe the dynamic forces acing on the rig, identifying the most hazardous behaviour for the ship. Detailed studies on the computational set-up for simulating a single sail in extreme conditions was performed during 2020, and this project will use these experiences to move forward.

Miscellaneous

The master thesis project is 30 credits and suitable for one or two students. The project is jointly supervised by both Chalmers M2 Division of Marine Technology and SSPA. Preferably, the project would start mid-January 2020 and run to June, but this can be adjusted if needed.

Prerequisites

- Background in Mechanical Engineering, Naval Architecture, or similar
- Knowledge and interest in computational fluid dynamics

Contact

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Application deadline for this thesis project is November 20, 2020.