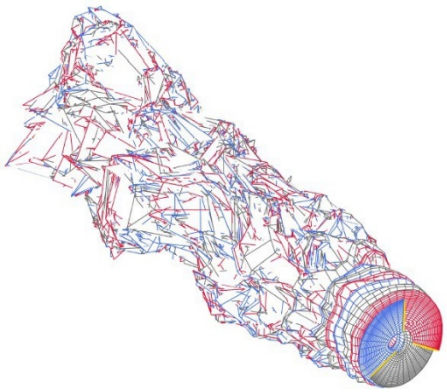
Master Thesis Proposal in Fluid Dynamics

Aerodynamic simulations for a wind-powered ship

Background: Wind powered ships could be a feasible way to reduce the fossil fuel emission from shipping. In the ongoing research project Oceanbird, Wallenius Marine in cooperation with SSPA, KTH and Chalmers develops methods for conceptual design of wind powered ships.

Project description: For assessing the aerodynamic performance of the rig, several computational methods can be used. It is important to find a method that is accurate enough, at the same time fast enough to be applicable for the design process. In this project, a simulation method developed for wind turbines the so-called Vortex Lattice Free Wake (VLFW) model will be evaluated and used to predict the aerodynamic performance of the rig. For this purpose, the existing in-house Vortex Lattice Free Wake (VLFW) code will be further developed and adopted for the aerodynamic loads on wing sails. The vortex lattice method (as the inviscid, incompressible and irrotational flow) has been widely used for aerodynamic analysis of airfoils and aircrafts. It is based on the thin lifting surface theory of vortex ring elements, in which the blade surface is replaced by vortex panels that are constructed based on the airfoil camber line of each blade section. The results of simulations will be compared against available result from other computational methods as well as wind tunnel test results of the Oceanbird rig.



Special entry requirements: Fortran and Matlab programming language, Fluid mechanics.

Targeted students: M, F, Z, V

Group size: 1-2 students.

No. of Credits: 30/60 hp.

Supervisor: The project will be supervised by Chalmers Industriteknik (CIT), SSPA, and Dept. of Mechanics and Maritime Sciences, Div. of Fluid Dynamics at Chalmers.

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References:

[1] H. Abedi. Development of Vortex Filament Method for Wind Power Aerodynamics. PhD thesis, Department of Applied Mechanics, Chalmers University of Technology, Göteborg, 2016.

[2] J. D. Anderson. Fundamentals of Aerodynamics. 6th edition. McGraw-Hill, 2011.