Determine high Reynolds number section data for vertical axis wind turbine airfoils

Background and motivation

SeaTwirl's wind turbines use a vertical-axis wind turbine with a tower connected to the sub-sea structure, consisting of a floating element and a keel. As the energy of the wind causes the turbine to rotate, the structure maintains its stability by using the keel and the counter turning moment, similar to the function of a keel on a sailboat.

During a rotation the blades experience a wide range of angles of attack and very high Reynolds number. The performance prediction and loads prediction models depend on accurate section data for the aerofoils used. Such data can be determined using CFD and the URANS method.

Objectives and goals of the project

The goal is to calculate the aerodynamic properties of a few different airfoils at the relevant angles of attack, that can be used for accurate loads and performance prediction of the next generation of wind turbines.

Methods and tools

Utilize open source CFD tools and the Unsteady RANS method to study a short 3D section of the blade at various angles of attack. Compare simulation results with published measurements for reference airfoils.
Tools:

- Open source CFD

The project should be carried out by one student or two students working together.

The MSc thesis project should incorporate (at least) the following tasks:

- Literature study on the topic
- Simulation development
- Write a thesis report and present it on a public seminar.

Contact person (SeaTwirl):

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Contact person (examiner and supervisor at Chalmers):

To be decided