Determine constants of the Risø dynamic stall model for a vertical axis wind turbine in high Reynold's number flow

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 rotation the blades experience a wide range of angles of attack. When the angle of attack rapidly changes the blades will experience dynamic stall, a non-linear unsteady aerodynamic effect. Risø is one dynamic stall model and it uses several constants to tune the behaviour. The values of these constants could be improved to better suit VAWT's dynamic behaviour in a flow with high Reynold's number.

Objectives and goals of the project

The goal is to establish what values of the Risø constants are suited for a VAWT in a flow with a high Reynold's number.

Methods and tools

Utilize CFD tools and literature to establish the values to best model the dynamic stall behaviour of SeaTwirl's VAWT.
Tools:

- CFD tools

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

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

- Literature study on the topic: dynamic stall and aerodynamic performance for VAWT
- Simulation development
- Write a thesis report and present it at a public seminar.

Contact person (SeaTwirl):

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Contact person (examiner and supervisor at Chalmers):

To be decided