Velocity field around darrieus wind turbine rotor using actuator cell model and other cfd methods

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Abstrak

The main purpose of this work is to analyze the usefulness of the active cell model (ACM) developed by the author of this article to estimate the flow field around a single-bladed vertical-axis wind turbine (VAWT) with the Darrieus-type rotor. The obtained flow velocity fields were compared with the experimental values taken from the literature available on the Internet. Additionally, the flow fields around the rotor and the aerodynamic forces were determined using the following approaches: the 𝑘-𝜀 RNG turbulence model, the scale-adaptive simulation (SAS) and the laminar model. The velocity profiles behind the turbine rotor obtained with all numerical approaches are consistent with the experiment. The aerodynamic blade loads obtained using numerical methods also appear to be satisfactory.