P. Chaviaropoulos, M.O.L Hansen, "*Investigating 3-D and Rotational Effects on Wind Turbine Blades by Means of a Quasi-3D Navier-Stokes Solver",* Journal of Fluids Engineering, Vol. 122, pp 330-336, June 2000.

Abstract

Three-dimensional and rotational viscous effects on wind turbine blades are investigated by means of a quasi-3D Navier-Stokes model. The governing equations derive after integrating the primitive variable form of the 3-D Navier-Stokes equations, written in cylindrical coordinates at the relative frame, along the radial direction and making certain assumptions for the mean values of the radial derivatives. The analysis shows that the local chord by radii ratio and the twist angle are the driving parameters. The governing equations are numerically integrated by means of a pressure correction algorithm. Both laminar and turbulent flow simulations are performed. The former are used for identifying the physical mechanism associated to the 3-D and rotational effects, while the latter for establishing a semi-empirical correction law for the load coefficients based on 2-D profile data.

Keywords

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