P.Chaviaropoulos, et. al, "*Viscous and Aeroelastic Effects on Wind Turbine Blades. The VISCEL Project. Part I: 3D Navier-Stokes Rotor Simulations*", Journal Wind Energy, Vol 6, pp. 365-385, (2003).

Abstract

Aerodynamic modeling of HAWT rotors by means of "engineering methods" has reached a saddle point, where no further development can be expected without a breakthrough in understanding the physics of unsteady, rotating three-dimensional flows. However, such a breakthrough becomes ever more necessary, as the size of the wind turbines increases. With the experimental work in that direction being mostly limited to observing the phenomena and interpreting the associated mechanisms, and its increased cost, alternatives are being sought. The use of CFD techniques and state-of-the-art Navier-Stokes solvers is considered a very serious contender, a belief shared by the members of the present consortium, which has worked on the VISCEL JOR3-CT98-0208 Joule III project. This project's goal was to determine the aerodynamic characteristics as well as the aeroelastic behavior of wind turbine blades across their broad range of operational conditions, from attached to highly separated flow regimes. The work programme included specific tasks for the validation and assessment of existing 3D solvers, for the parametric study of 3D flow around realistic blades and for the investigation of aeroelastic stability, at the blade section level.

Keywords

Wind Turbines, 3D Aerodynamics, Aeroelastic Stability, Navier-Stokes Solvers