

Wind forecasting at small scale with a Probability Density Function method

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Abstract

Through years various methods have been developed for the simulation of turbulent flows: Direct Numerical Simulation (DNS) of incompressible Navier-Stokes equations, RANS-based methods, LES methods, ... In this talk, we present a new approach based on the reinterpretation of the RANS equations using a Probability Density Function method. This method introduced in the eighties aims to simulate turbulent reacting/combustion flows through a lagrangian particle system which evolves according to some stochastic dynamics. The Eulerian fields describing the turbulent flow are obtained with the computation of the averaged mean extracted from the information of the particle system. After a general presentation of this method, we will speak about an extension of this method for the simulation of atmospheric flow near the ground (between 0 and 800 meters) and some numerical issues related to this extension: modelling of log-law layer, incompressibility, mills, ... Finally, we show some numerical results obtained for wind at small scale and for the simulation of wind farms.