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Numerical simulation of aerodynamics and dynamics of wind turbines DMYTRO REDCHYTS, Institute of Transport Systems and Technologies of National Academy of Science of Ukraine — Processes of aerodynamics and dynamics are described by incompressible Reynolds averaged Navier-Stokes equations and the equation of wind turbine rotation. Three one-equation turbulence models SA, SARC and SALSA are used. Incompressible Navier-Stokes equations were solved in time-accurate manner using the method of pseudocompressibility and Rogers-Kwak scheme. The finite-volume approach in generalized coordinates was used. Verification of the developed CFD algorithms and codes is carried out on the problems on flow around fixed and rotating cylinders. Comparison of turbulence models is given for a flow around the NACA 4412 airfoil. Instantaneous streamlines, vorticity fields and hysteresis of the unsteady aerodynamic characteristics are discussed for an oscillating NACA 0015 airfoil. It is shown that SALSA model demonstrates its advantages on massive flow separation and dynamic stall. Results of numerical simulation for wind turbine rotors with different geometrical characteristics and different number of blades are presented. Physical features of the flow near wind turbine blades, such as boundary layer separation and flow interactions between the blades are discussed.

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