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An adaptive lattice Boltzmann method for predicting turbulent wake fields in wind parks RALF DEITERDING, German Aerospace Center (DLR) - Institute for Aerodynamics and Flow Technology, STEPHEN L. WOOD, University of Tennessee - Knoxville, The Bredesen Center — Wind turbines create large-scale wake structures that can affect downstream turbines considerably. Numerical simulation of the turbulent flow field is a viable approach in order to obtain a better understanding of these interactions and to optimize the turbine placement in wind parks. Yet, the development of effective computational methods for predictive wind farm simulation is challenging. As an alternative approach to presently employed vortex and actuator-based methods, we are currently developing a parallel adaptive lattice Boltzmann method for large eddy simulation of turbulent weakly compressible flows with embedded moving structures that shows good potential for effective wind turbine wake prediction. Since the method is formulated in an Eulerian frame of reference and on a dynamically changing nonuniform Cartesian grid, even moving boundaries can be considered rather easily. The presentation will describe all crucial components of the numerical method and discuss first verification computations. Among other configurations, simulations of the wake fields created by multiple Vesta V27 turbines will be shown.

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