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A concurrent precursor inflow method for LES of atmospheric boundary layer flows with variable inflow direction for coupling with meso-scale models[1] WIM MUNTERS, KU Leuven, Mechanical Engineering, B3001 Leuven, Belgium, CHARLES MENEVEAU, Johhns Hopkins University, Baltimore MD 21218, USA, JOHAN MEYERS, KU Leuven, Belgium — In order to incorporate multiple scales of meteorological phenomena in atmospheric simulations, subsequent nesting of meso-scale models is often used. However, the spatial and temporal resolution in such models is too coarse to resolve the three-dimensional turbulent eddies that are characteristic for atmospheric boundary layer flows. This motivates the development of tools to couple meso-scale models to Large-Eddy Simulations (LES), in which turbulent fluctuations are explicitly resolved. A major challenge in this area is the spin-up region near the inlet of the LES in which the flow has to evolve from a RANS-like inflow, originating from the meso-scale model, to a fully turbulent velocity field. We propose a generalized concurrent precursor inflow method capable of imposing boundary conditions for time-varying inflow directions. The method is based on a periodic fully-developed precursor boundary-layer simulation that is dynamically rotated with the wind direction that drives the main LES. In this way realistic turbulent inflow conditions are applied while still retaining flexibility to dynamically adapt to meso-scale variations in wind directions. Applications to wind simulations with varying inflow directions, and comparisons to conventional coupling methods are shown.

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