One-way coupling of nested grids in WRF-LES and local LES for turbulent boundary layer TETSURO TAMURA, Tokyo Institute of Technology, KOJIRO NOZAWA, Shimizu Corporation — This study proposes the method of one-way coupling between nested grids with different resolution for LES of turbulent boundary layer. Based on the difference of the momentum equations for the coarse and fine grids, we deduce the equation of the finer-grid component of velocity fluctuations. This equation has two types of SGS stress terms. One is the energy cascade from finer-grid GS turbulence to SGS turbulence and the other is the production term in this equation which cascades turbulence energy from coarser grid to finer grid. In order to validate the proposed method, we consider the a-priori test. Coarser-grid velocity is obtained by filtering the solution computed on finer grid. There are two types of finer-grid component of velocity, such as the predicted values by solving the proposed equation or the exact values. Comparison has been performed for the results of rough-wall turbulent boundary layer simulation. The spectra of velocity fluctuation obtained as sum of the predicted finer-grid component and the coarser-grid velocity appropriately fit to the -5/3 power law for the inertial sub-range. As posteriori test, the proposed method is also applied to atmospheric flows nesting WRF-LES and local LES. Coarser-grid velocity is obtained by WRF-LES. Finer-grid solutions are checked and the potential of the proposed method is investigated.

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