

Numerical simulation on the flow around a train under crosswind conditions

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Abstract

This report describes large-scale simulations of flow around an embankment within a turbulent boundary layer. The computational domain of the flow around the embankment needs an inflow boundary condition, which simulates the turbulent boundary layer. In order to realize the numerical simulation with the inflow turbulence, we tried two flow simulations simultaneously, one of them regarding the flow domain of the embankment and the other of the turbulent boundary layer, which is applicable to determine the inflow condition of the embankment. The numerical model and conditions on the Earth Simulator were identical as previous numerical simulations on the XT4 (Cray) in RTRI, except grid resolution. We compared the instantaneous flow field with the simulations, and we observed finer vortex structures by computing on the Earth Simulator. From a comparison of the statistics of the flow field between Earth Simulator computation and XT4 computation, we observed the nearly equal mean velocity, but the velocity fluctuation of the Earth Simulator was slightly larger than XT4.

Keywords: Railway, Crosswinds, Large-scale simulation, LES, Embankment, Turbulent boundary layer