

Scale Effects on the Wake Airflow of a Heavy Truck

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Abstract : Air quality in urban areas is deteriorated by pollution, mainly due to the constant increase of the traffic of different types of ground vehicles. In particular, particulate matter pollution with important concentrations in urban areas can cause serious health issues. Characterizing and understanding particle dynamics is therefore essential to establish recommendations to improve air quality in urban areas. To analyze the effects of turbulence on particulate pollutants dispersion, the first step is to focus on the single-phase flow structure and turbulence characteristics in the wake of a heavy truck model. To achieve this, Computational Fluid Dynamics (CFD) simulations were conducted with the aim of modeling the wake airflow of a full- and reduced-scale heavy truck. The Reynolds Average Navier-Stokes (RANS) approach with the Reynolds Stress Model (RSM) as the turbulence model closure was used. The simulations highlight the apparition of a large vortex coming from the under trailer. This vortex belongs to the recirculation region, located in the near-wake of the heavy truck. These vortical structures are expected to have a strong influence on particle dynamics that are emitted by the truck.

Keywords : CDF, heavy truck, recirculation region, reduced scale

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