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Impacts of atmospheric aerosols on urban boundary layer dynamics: Application during the CAPITOUL field experiment

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The aim of this study is to better understand the direct radiative impact of urban aerosol particles on atmospheric dynamics. This work is based on data collected in Toulouse, France, during the CAPITOUL field campaign, and on explicit aerosol modeling using the mesoscale model MesoNH (Lafore et al., 1998) fully coupled with the ORILAM (ORganic and Inorganic Lognormal Aerosol Model) aerosol scheme. High resolution simulations (500 meters) have been performed over the city of Toulouse for a summer intensive observation period (IOP). In addition, a 500-m resolution emission inventory has been developed over the Toulouse region, using the COPERT 4 software and data from the French national institute in charge of road traffic. A reference simulation has been validated in regard of field observations (dynamics, gas and aerosol chemistry). Then, this reference simulation has been compared with a simulation which takes into account the direct radiative effect of particles by using the aerosol physical properties and the Mie theory and Maxwell-Garnett equation (Tombette et al. 2008). Finally, the study focuses on the effect of aerosol particles on urban boundary layer dynamics such as temperature variations due, for example, to the light absorption by black carbon (BC) aerosol.