Geophysical Research Abstracts
Vol. 21, EGU2019-14296-1, 2019
EGU General Assembly 2019

On the impact of urban canopy forcing on the vertical turbulent transport of pollutants

Peter Huszar (1), Jana Doubalova (1,2), Jan Karlicky (1), Michal Belda (1), Tomas Halenka (1), and Katerina Sindelarova (1)

(1) Charles University, Faculty of Mathematics and Physics, Dept. of Atmospheric Physics, Prague, Czech Republic (peter.huszar@mff.cuni.cz), (2) Czech hydro-meteorological service, Prague, Czech Republic

Urban surfaces are very distinct compared to their rural counterparts due to their specific geometry and physical properties. This brings modified transport of momentum, moisture and heat from/to urban surfaces and perturbs the radiative balance resulting in changed meteorological condition in cities. From an air quality perspective, one of the most important change is the increased turbulence enhancing vertical mixing of pollutants above cities. In this study, we use the regional climate model RegCM4 offline coupled to chemistry transport model CAMx6 over central Europe to study how urban surfaces affect the vertical turbulent transport of key pollutants. For the period of 2007-2011, numerous experiments are performed in order to evaluate the impact of different PBL schemes, different ways how the coefficient of vertical turbulent transport (Kv) is derived and different resolutions on both the surface concentrations and vertical profiles of ozone and PM2.5 over selected cities in central Europe. Results confirm that the turbulent transport is the most important forcing which is changed due to transition of rural surface to urbanized one. Ozone is subsequently increased by 2-4 ppbv while PM2.5 concentrations are reduced over urban areas by 2 μg/m3. It has been shown that the representation of turbulent transport lying the the choice of PBL scheme and the way Kv are derived have an important impact on the vertical profile but the fact, that turbulence is a key factor affecting the overall urban canopy forcing on urban air pollution remains valid.