Geophysical Research Abstracts
Vol. 20, EGU2018-5034, 2018
EGU General Assembly 2018

Ambient flow-tube study of VOCs exchange at the atmosphere-soil interface in Beijing

Guo Li (1,3), Yafang Cheng (1,2), Uwe Kuhn (1), Rongjuan Xu (3), Yudong Yang (3), Hannah Meusel (1), Nan Ma (2), Yusheng Wu (4), Meng Li (1), Thorsten Hoffmann (5), Markus Ammann (6), Ulrich Pöschl (1), Min Shao (2), Hang Su (2,1)

(1) Max Planck Institute for Chemistry, Multiphase Chemistry Department, Mainz, Germany (guo.li@mpic.de), (2) Institute for Environmental and Climate Research, Jinan University, Guangzhou, China , (3) College of Environmental Sciences and Engineering, Peking University, Beijing, China , (4) State Key Joint Laboratory of Environmental Simulation and Pollution Control, College of Environmental Sciences and Engineering, Peking University, Beijing, China , (5) Institute of Inorganic Chemistry and Analytical Chemistry, Johannes Gutenberg University Mainz, Mainz, Germany , (6) Laboratory of Environmental Chemistry, Paul Scherrer Institute, 5232 Villigen, Switzerland

Volatile organic compounds (VOCs) represent a large fraction of organic carbon in the atmosphere and play an important role in atmospheric chemistry. Deep insight into the VOCs-related tropospheric chemistry requires a profound understanding of sources and sinks of different VOCs species. Multiphase processes on the surface of soil and airborne soil-derived particles have been suggested as an important mechanism for the production/removal of atmospheric trace gases and aerosols. In this work, we investigated the exchange of 13 species of VOCs at the atmosphere-soil interface using a coated-wall flow tube system coupled to a PTR-MS, under ambient conditions at an urban background site in Beijing. The results show that most of the species tend to be absorbed/adsorbed and further retained or converted into other products by soil (net influx into soil) while formic acid can most probably be produced by soil either due to chemical transformation of other absorbed/adsorbed species or emission from soil itself (net efflux from soil). For the species showing noticeable uptake, their uptake coefficients display a gradually decrease along the measurement time, suggesting a progressive saturation of the soil surface. The uptake of several species (e.g., methanol, acetic acid and formaldehyde), however, don't exhibit marked dependence on time. Moreover, the exchange behavior dependence on environmental parameters (i.e. RH, T and concentration) is analyzed and the results show that, uptake of some species (e.g., isoprene, and MVK+MACR) on soil surfaces can be enhanced by increasing RH or/and decreasing T and the species concentration; while these operations may lead to opposite effects for formic acid (positive concentration dependence) and acetaldehyde. Based on our results, mineral soil serves as a sink rather than a source for most VOC species.