Geophysical Research Abstracts
Vol. 19, EGU2017-5869-1, 2017
EGU General Assembly 2017


# Nitrous acid in a street canyon environment: sources and the contribution to local oxidation capacity

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Nitrous acid (HONO) is one of the dominant sources of hydroxyl radical (OH) and plays an important role in photochemical oxidation processes in the atmosphere. Even though HONO has been extensively studied in urban areas, its importance and effects in street canyon microenvironment has not been thoroughly investigated. Street canyons which suffer serious air pollution problem are widely distributed in downtown areas with paralleled high buildings and narrow roads in the center. In this study, we measured HONO at a roadside of a street canyon in urban Hong Kong and applied an observation-based box model based on Master Chemical Mechanism (MCM 3.3) to investigate the contribution of HONO to local oxidation chemistry. Higher HONO mixing ratios were observed in the daytime than in the nighttime. An average emission ratio ($\Delta$HONO/$\Delta NO_x$) of 1.0% ($\pm$0.5%) was derived at this roadside site and the direct HONO emission from vehicles contributed to 38% of the measured HONO in the street canyon. Heterogeneous $NO_2$ conversion on humid ground or building surfaces and the uptake of $NO_2$ on fresh soot surfaces were the other two important HONO sources in this microenvironment. OBM simulations constrained with observed HONO showed that the peak concentration of OH, $HO_2$ and $RO_2$ is 7.9, 5.0 and 7.5 times of the result in the case with only OH+NO as HONO source. Photolysis of HONO contributed to 86.5% of the total primary radical production rates and can lead to efficient $NO_2$ and $O_3$ production under the condition of weak regional $O_3$ transport. Our study suggests that HONO could significantly increase the atmospheric oxidation capacity in a street canyon which may impact the secondary formation of aerosols and OVOCs.