Geophysical Research Abstracts
Vol. 21, EGU2019-6311, 2019
EGU General Assembly 2019

Observation of the nitrous acid in winter Beijing

Shengrui Tong, Wenqian Zhang, and Maofa Ge

State Key Laboratory for Structural Chemistry of Unstable and Stable Species, CAS Research/Education Center for Excellence in Molecular Sciences, Institute of Chemistry, Chinese Academy of Sciences, Beijing 100190, P. R. China. (tongsr@iccas.ac.cn)

Continuous measurements of nitrous acid (HONO) were performed from December 16 to 31 in 2017 in both urban of Beijing and Xianghe and from December16 to 23 in 2016 in urban of Beijing, and study the formation mechanism of HONO. ICCAS site (an urban of Beijing): in NO.2 building of Institute of Chemistry, Chinese Academy of Sciences (ICCAS, 116°19'21.58"E, 39°59'22.68"N). Xianghe site: on the roof of a container in Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP) site in Xianghe (116°58'30.67"E, 39°45'39.53" N). The measurement campaign in 2017 in both sites included a clean-haze-clean transformation process. HONO concentrations showed similar variations in the two sites. Moreover, correlations of HONO with NOX, NO_2, NO, PM2.5 and relative humidity (RH) were studied for exploring the possible HONO formation pathways, and contributions of direct emissions, heterogeneous reactions, and homogeneous reactions were also calculated. Interactions between HONO and NO_2, PM2.5 and RH were studied by comparing the differences of typical haze processes in the two sites. HONO effects on haze outbreak as well as the key factors in HONO formations were explore by analyzing possible HONO formation mechanisms. The measurement in 2016 was divided into three periods: I (haze), II (severe haze) and III (clean), according to the levels of PM2.5. This pollution episode was characterized by high levels of NO (75 $\pm$ 39 and 94 $\pm$ 40 ppbV during periods I and II, respectively) and HONO (up to 10.7 ppbV). During the nighttime, the average heterogeneous conversion frequency during the two haze periods were estimated to be 0.0058 and 0.0146 h^{-1}, and it was not the important way to form HONO. Vehicle emissions contributed 52% ($\pm$16)% and 40% ($\pm$18)% to ambient HONO at nighttime during periods I and II. The contribution of homogeneous reaction of NO with OH should be reconsidered under high-NO_x conditions and could be noticeable to HONO sources during this pollution event. Furthermore, HONO was positively correlated with PM2.5 during periods I and II, suggesting a potential chemical link between HONO and haze particles. The HONO during the winter of 2016 and 2017 have different sources which will be further discussed.