5.008 Seasonal variation and nighttime formation of particulate organic nitrates in South China urban atmosphere.

Early Career Scientist

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Abstract:

Organic nitrates, which are mainly formed via NO_3 radical addition to alkene (especially biogenic VOCs) or in a minor branching pathway through peroxy radicals reacting with NO, are important atmospheric species as they affect the cycling of NOx and the ozone production. With relatively high biogenic VOCs and anthropogenic NOx levels, South China is an ideal region to investigate organic nitrates. In this study, an Aerodyne High-Resolution Time-of-Flight Aerosol Mass Spectrometry (HR-ToF-AMS) was deployed at an urban site in South China from 2015 to 2016 to characterize the submicron aerosols. Based on the measurements, we estimate that 41-64% of the total measured nitrates are from organic nitrate in summer and 16%-25% in autumn, while in winter and spring, most measured nitrates are inorganic. Furthermore, the contribution of organic nitrates to total organic aerosols (OAs) is estimated to be 12%-29% in summer and 8%-14% in autumn. The diurnal pattern of organic nitrate in summer and autumn both show pronounced increase during nighttime (18:00-7:00), which is quite different from that of the total measured nitrates. This observation implies that the organic nitrates are formed from NO_3 -initiated reaction with BVOCs. In addition, the good correlation (R=0.91 in summer and 0.78 in autumn) between organic nitrates and less-oxidized oxygenated OA (LO-OOA) factor using PMF method during nighttime indicates LO-OOA is closely related to nighttime NO_3 radical chemistry. Therefore, we estimate the NO_3 radical concentration and secondary organic aerosol (SOA)formation from some of the key BVOCs during the nighttime. The results show that the estimated SOA concentration correlates well with LO-OOA and organic nitrates. Consequently, the monoterpene reacts with NO_3 radical, which is the potential formation pathway of the organic nitrates in the South China urban region.