2.039 Characteristics of atmospheric peroxyacetyl nitrate and its precursors at an urban site in Beijing, China .

Early Career Scientist

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Abstract:

Atmospheric peroxyacetyl nitrate (PAN) is an important secondary gas pollutant formed in photochemical reactions of volatile organic compounds (VOCs) in the presence of NOx. PAN can act as a reservoir for NOx and plays an important role in atmospheric photochemistry. Previous measurements of PAN in Asian megacities were mainly conducted for short periods in summer. Here we present a 1-year continuous measurements of PAN and its precursors (NOx and VOCs) at an urban site (Chinese Meteorological Administration, CMA) in Beijing and focus mainly on their correlation during wintertime. No distinct seasonal variation pattern could be discerned, with the highest monthly average concentration occurring in Sep. 2016 and the lowest concentration in Feb. 2017. NO_2 reveals a clear seasonal variation with high concentrations during winter and lower ones in summer. Most oxygenated VOCs (oVOCs) displayed low concentrations during Feb. to Mar. 2017, while their peaks occurred during different times in the year. The variation of PAN is also governed by thermal dissociation, which peaks in May and can account for a loss of 10-30% during Apr. to Oct. 2017. Thermal dissociation was very weak during Nov. 2016 to Mar. 2017 and its effect on PAN concentrations is negligible. During summer, PAN shows relative good correlation to O_3, while during winter, the variation of PAN and O_3 are decoupled. Wintertime PAN is significantly positively correlated to the total concentration acetaldehyde, acetone and propanal and negatively to the ratio NO/NO_2. Additionally, PM2.5 during winter also displayed a significant correlation to the total concentration acetaldehyde, acetone and propanal, explaining 74% of its total variance, which may indicate that PM2.5 in Beijing has similar sources as these oVOCs, or that fine particle surface promotes the production of these oVOCs.