

2.158 Isoprene Nitrate Chemistry in Beijing.

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Abstract:

An analytical system based on gas chromatography / mass spectrometry was deployed in Beijing to measure individual isoprene derived nitrates (IN). This was done as part of the AIRPRO project (An Integrated Study of AIR Pollution PROCesses in Beijing) under the NERC/NSFC Air Quality and Human Health in a Chinese Megacity programme. There were two field campaigns: one in the winter (November 2016) and one in the summer (May/June 2017).

Isoprene nitrates derived through different isoprene oxidation pathways were observed: 1) the hydroxynitrates (4,3)-IN and (1,2)-IN derived from hydroxyl radical (OH) oxidation; 2) the aldehydic nitrates E(1,4)-al-IN, Z(1,4)-al-IN, E(4,1)-al-IN and Z(4,1)-al-IN derived from nitrate radical (NO₃) oxidation; and 3) acetone nitrate (NOA) that can be derived via both OH and NO₃ oxidation of isoprene.

In winter the observed IN followed a similar pattern to many of the other observed pollutants, cycling between periods of highly polluted and cleaner days.

In the summer the hydroxynitrates, (1,2)-IN and (4,3)-IN, were found to exhibit a clear daytime maximum and to have a concentration ratio of about 4:1. Although we have previously measured the hydroxy nitrates E(1,4)-IN, Z(1,4)-IN, E(4,1)-IN and Z(4,1)-IN in simple photolysis experiments in the laboratory, we did not detect them in the field. The

aldehydic nitrates exhibited an evening/night-time peak, whilst NOA had a diel profile that was consistent with both a daytime and a night-time source.

The observed IN concentrations are assessed against observed OH, NO₃ and isoprene concentrations and compared to IN simulated by a box-model using the Master Chemical Mechanism (MCM), and by the regional WRF-Chem model using a chemical mechanism based on MOZART in combination with the Mainz Isoprene Mechanism (MIM2). In this way we evaluate understanding of the production and loss processes of the IN.