Measurement of atmospheric nitrous acid at Bodgett Forest during BEARPEX2007

http://www.firstlight.cn 2010-07-12

Nitrous acid (HONO) is an important precursor of the hydroxyl radical (OH) in the lower troposphere. Understanding HONO chemistry, particularly its sources and contribution to HOx (=OH+HO2) production, is very important for understanding atmospheric oxidation processes. A highly sensitive instrument for detecting atmospheric HONO based on wet chemistry followed by liquid waveguide long path absorption photometry was deployed in the Biosphere Effects on Aerosols and Photochemistry Experiment (BEARPEX) at Blodgett Forest, California in late summer 2007. The median diurnal variation shows minimum HONO levels of about 20–30 pptv during the day and maximum levels of about 60–70 pptv at night, a diurnal pattern quite different from the results at various other forested sites. Measured HONO/NO2 ratios for a 24-h period ranged from 0.05 to 0.13 with a mean ratio of 0.07. Speciation of reactive nitrogen compounds (NOy) indicates that HONO accounted for only ~3% of total NOy. However, due to the fast HONO loss through photolysis, a strong HONO source (1.59 ppbv day−1) existed in this environment in order to sustain the observed HONO levels, indicating the significant role of HONO in NOy cycling. The wet chemistry HONO measurements were compared to the HONO measurements made with a Chemical Ionization Mass Spectrometer (CIMS) over a three-day period. Good agreement was obtained between the measurements from the two different techniques. Using the expansive suite of photochemical and meteorological measurements, the contribution of HONO photolysis to HOx budget was calculated to be relatively small (6%) compared to results from other forested sites. The lower HONO mixing ratio and thus its smaller contribution to HOx production are attributed to the unique meteorological conditions and low acid precipitation at Blodgett Forest. Further studies of HONO in this kind of environment are needed to test this hypothesis and to improve our understanding of atmospheric oxidation and nitrogen budget.

存档文本