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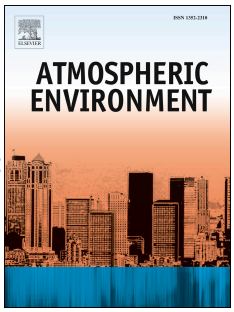

Characteristics and sources of nitrous acid in an urban atmosphere of northern China: Results from 1-yr continuous observations

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Characteristics and sources of nitrous acid in an urban atmosphere of northern China: Results from 1-yr continuous observations

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Abstract

Nitrous acid (HONO) is a key reservoir of the hydroxyl radical (OH) and plays a central role in the atmospheric chemistry. To understand the sources and impact of HONO in the polluted atmosphere of northern China, continuous measurements of HONO and related parameters were conducted from September 2015 to August 2016 at an urban site in Ji'nan, the capital city of Shandong province. HONO showed well-defined seasonal and diurnal variation patterns with clear wintertime and nighttime concentration peaks. Elevated HONO concentrations (e.g., over 5 ppbv) were frequently observed with a maximum value of 8.36 ppbv. The HONO/NO_X ratios of direct vehicle emissions varied in the range of 0.29%-0.87%, with a mean value of 0.53%. An average NO_2-to-HONO nighttime conversion frequency (k_{het}) was derived to be 0.0068 ± 0.0045 h^{-1} from 107 HONO formation cases. A detailed HONO budget analysis suggests an unexplained daytime missing source of 2.95 ppb h^{-1} in summer, which is about seven times larger than the homogeneous reaction of NO with OH. The effect of HONO on OH production was also quantified. HONO photolysis was the uppermost source of local OH radical throughout the daytime. This study provides the year-round