1.126 Sources and Heterogeneous Production of Nitrous Acid and Impacts on Air Quality:Overview of Results from Integrated Field, Lab and Modeling Studies in Hong Kong.

Early Career Scientist

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Abstract:

Nitrous acid (HONO) plays an important role in the chemistry of polluted atmosphere, but its sources in different environments are not well understood. Here we give an overview of our recent efforts in investigating the sources and formation of HONO by combining the field measurement, lab experiments and model simulation. Since 2011, a series of field studies on HONO was carried out at several sites (one sub-urban, one coastal background, one mountain-top, one roadside and one tunnel) in Hong Kong, which is situated on the South China coast. The data are examined to elucidate seasonal characteristic, emission factors, heterogeneous production, and its photochemical impacts. The derived HONO emission factors from vehicles showed high variability, and for most of time, higher than the r uniformed value of 0.8% reported in literatures. Larger nocturnal heterogeneous conversion rates of NO_2-to-HONO were observed when air masses passing over sea surfaces than land surfaces (~3 times), suggesting that air-sea interactions may be a significant source of atmospheric HONO which has never been considered in previous air quality model studies. For selected episodes, the strengths of the ‘unknown’ daytime source were estimated, and its correlations with different surfaces suggest that aerosols could play a more important role in HONO production than ground when aerosol loading and humidity is high. Furthermore, a series of flow-tube lab experiments found that SO_2 aging on mineral particles could significantly enhance the uptake of NO_2 and HONO formation. The up-to-date HONO sources were parameterized

into a WRF-Chem model, to better understand its impacts on air quality. The revised model significantly improved the simulations of ozone, and increased ozone concentrations by 6-12% over urban areas in HK-PRD region. Our studies reveal the complexity of HONO sources and chemistry, and demonstrate its importance in transforming NO_X, photochemistry and air quality in polluted regions.