



Impacts of nitrous acid sources on the atmosphere oxidation capacity in China

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The hydroxyl radical (OH) is the dominant oxidant in the troposphere. As a major source of OH, HONO could have a significant impact on the formation processes of ozone (O₃) and major inorganic aerosols, which may further affect the regional air quality. The additional HONO sources [i.e. the daytime HONO source, HONO emissions, and nighttime hydrolysis conversion of nitrogen dioxide (NO₂) on aerosols] were coupled into the WRF-Chem model (Weather Research and Forecasting model coupled with Chemistry) to assess the daytime HONO source impacts on the atmosphere oxidation capacity, especially the budgets of RO_x (=OH+HO₂+RO₂) in the coastal regions of China. The results shows that monthly daytime-mean concentrations of OH [U+3001] HO₂ and RO₂ are increased by 60~120%, 120~250% and 80~180%, respectively, due to the additional daytime HONO sources. The photolysis of HONO becomes the second important source of OH with a maximum of 0.89~3.72 [0.62~3.06 due to the Punknown] ppb h⁻¹; whereas, the reaction of HO₂ and NO is the most important source of OH with a maximum of 2.63~9.38 [1.15~7.23 due to the Punknown] ppb h⁻¹ in the coastal regions of China. Besides, the daytime HONO source significantly accelerates RO_x cycles by increasing the production and loss rates of OH [U+3001] HO₂ and RO₂ and their conversation rates with each other. The above results suggest that the daytime HONO source considerably enhanced atmosphere oxidation capacity in the coastal regions of China, and could produce significant increases in concentrations of inorganic aerosols and secondary organic aerosols and further aggravate haze events in these regions.