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Examining the high variability in particulate nitrate photolysis rate constant

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Photolysis of particulate nitrate (pNO3) has been proposed to be an effective renoxification pathway and a major daytime HONO source in low-NOx atmosphere. However, recent studies have indicated that pNO3 photolysis rate constant (J_{pNO3}) can vary over a large range, by more than 3 orders of magnitude, making the role of this process in atmospheric reactive nitrogen cycling ranging from dominant to marginally important. In this study, aerosol samples are collected from various air masses in different environments and photochemical exposure experiments are conducted to determine J_{pNO3}. When normalized to ground-level tropical noontime conditions, the determined J_{pNO3} varies from 1.0×10^{-6} to 1.8×10^{-5} s^{-1} with a median value of 2.6×10^{-6} s^{-1} for marine aerosols collected in Bermuda (N=182), from 6.1×10^{-5} to 9.5×10^{-4} s^{-1} with a median value of 1.4×10^{-4} s^{-1} for continental aerosols collected in rural and remote locations in Eastern U.S. (N=28), and from 6.2×10^{-6} to 1.3×10^{-4} s^{-1} with a median value of 6.0×10^{-5} s^{-1} for urban aerosol samples collected in Downtown Albany (N=12). Detailed discussions will be presented on how the measured J_{pNO3} are affected by major factors including aerosol composition and acidity, particle size distribution, pNO3 loading, and organic content. New results from ongoing experiments will be presented on the potential effects of sampling and storage of aerosols on their photochemical reactivity.