CHARACTERIZING THE ABSORPTION AND PHOTODISSOCIATION OF ATMOSPHERIC NITRATE VIA ACTION SPECTROSCOPY

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The nitrate anion is the final sink for NOx species and plays a crucial role in the chemical processes of Earth's atmosphere, hydrosphere, and cryosphere. In particular, the photodissociation of nitrate from Antarctic snow forms radical oxygen which, when reacted with ambient water, forms radical OH, arguably the most important oxidative species in the atmosphere. While it is well-known that actinic radiation ($>$290 nm) can be absorbed by the nitrate ion and photodissociate it, the exact mechanism is unclear. In particular, the absorption mechanism is unclear since the only singlet state in that range is a symmetry forbidden transition. Theoretical studies have shown that the absorption could be allowed via vibronic coupling or by spin-orbit coupling to the nearby triplet state. It has also been shown that the intensity of the forbidden transition is highly sensitive to the presence of water. Here, we perform photodissociation action spectroscopy over the 300 nm range to experimentally determine a gas phase NO_3^- and $NO_3^-(H_2O)$ UV absorption spectrum. Our setup also enables the investigation of the photodissociation products branching ratios as a function of wavelength. This will allow for a more comprehensive understanding of the nitrate photodissociation mechanism.