

Cavity Ring-Down Spectroscopy in Exploration of the Reactivity of Atmospheric Systems

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Cavity ring-down (CRD) spectroscopy provides a sensitive tool for the study of spectra and the reactivity of atmospheric molecular systems. Specifically we employ CRD to investigate vibrational overtone spectra and vibrational overtone initiated chemical dynamics. CRD is uniquely equipped for these sorts of problems due to the weak observed cross sections for vibrational overtone spectra. Spectroscopic studies have looked at cross sections for different X-H chromophores and concluded that the OH stretch has the largest cross section in the area of interest. Our system has been used to study the OH overtone stretches of various acids found in the Earth's atmosphere. Furthermore, it has provided spectroscopic information about hydrogen bonding in X-H chromophores. The CRD system in our lab is optimized to cover wavelength ranges from 610-680 nm and 740-795 nm in order to look at the $\nu_{OH} = 4,5$ overtone transitions. This is the turning point for concerted reactions in acids which will be demonstrated with the overtone driven dynamics of sulfuric acid (H_2SO_4) and pyruvic acid. Consequences of this overtone initiated chemistry in the Earth's atmosphere will be discussed.