



High-resolution Measurements of Gas-Phase Hydrogen Chloride (HCl) in the Atmosphere by Cavity Ring Down Spectroscopy

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Halogen radical species, such as chlorine and bromine atoms and their oxides, can greatly affect the chemical composition of the troposphere. Hydrogen chloride is the dominant (gas-phase) contributor to the tropospheric chlorine inventory. Real time in situ observations of HCl can provide an important window into the complex photochemical reaction pathways for chlorine in the atmosphere, including heterogeneous reactions on aerosol surfaces. In this work, we report a novel, commercially-available HCl gas-phase analyzer (G2108, Picarro Inc. Santa Clara, CA, USA) based upon Cavity Ring Down Spectroscopy (CRDS) in the near-infrared, and discuss its performance. With a measurement interval of approximately 2 seconds, a precision of better than 40 parts-per-trillion (1 sigma, 30 seconds), and a response time of approximately 1-2 minutes (10 – 90% rise time or 90 – 10% fall time), this analyzer is well-suited for measurements of atmospherically-relevant concentrations of HCl, in both laboratory and field. CRDS provides very stable measurements and low drift, requiring infrequent calibration of the instrument, and can therefore be operated remotely for extended periods of time. In this work we also present results from a laboratory intercomparison of the Picarro G2108 analyzer and an iodide ion time-of-flight Chemical Ionization Mass Spectrometer (CIMS), and the results of the analyzer time response tests.