Semi-continuous Measurement of Gas and Particle Phase Ions in Ambient Air

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Abstract: An instrument has been developed for the semi-continuous measurement of gas and particle phase ions in ambient air. The instrument utilizes a rotating wet denuder for the collection of gases (NH_3, HNO_3, HCl, HNO2, and SO2) and a steam-jet saturation chamber followed by a cyclone for collecting particles. The solution collected in the cyclone contains dissolved aerosol species (NH_4^+, NO_3^-, NO_2^-, Cl^-, SO_4^-, and SO_3^-). The denuder and cyclone solutions are pumped to separate collection vessels where sample accumulates prior to analysis. Ammonia and NH_4^+ are measured with a dedicated conductivity detector. Anion concentrations are determined using a compact ion chromatograph coupled with a conductivity detector. The instrument can be configured to measure either gases or particles, or both. Detection limits on the order of 0.05 ug/m3 for all species are achievable. The minimum time resolution for each measurement is 15 minutes. Design and operational characteristics are presented and discussed. A prototype instrument has been operated at two field studies in Atlanta and Sacramento. Data from these studies are presented.