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An Aerosol Chemical Speciation Monitor (ACSM) for Routine Monitoring of Atmospheric Aerosol Composition

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Abstract

In order to address the effect of aerosols on air quality, human health and climate, there is a need for instrumentation which is capable of reporting the chemical and microphysical properties of ambient particles. Over the years the Aerodyne Aerosol Mass Spectrometer (AMS) has proven to be a powerful instrument in measuring aerosol mass and chemical composition of non-refractory submicron aerosol particles in real-time. We present here results on the development and demonstration of a compact aerosol mass spectrometer system, the Aerosol Chemical Speciation Monitor (ACSM). The ACSM is designed and built around the same technology as our larger research grade AMS, in which an aerodynamic particle focusing lens is combined with high vacuum thermal particle vaporization and mass spectrometry. The ACSM provides composition information for particulate ammonium, nitrate, sulfate, chloride, and organic. This system uses lower cost components and thus operates with lower performance than the research grade AMS. However, it is much smaller, simpler to operate and maintain, and is stable for long periods of time (months). The ACSM is designed for routine monitoring of PM with sufficient sensitivity to provide chemically speciated mass loadings and aerosol mass spectra at data rates up to 15 min for typical ambient aerosol loadings. The ACSM is first deployed at the "field campaign for the Determination of the sources of atmospheric Aerosols in Urban and Rural Environments in Spain" (DAURE) in Montseny, Spain in March 2009. Results are presented from field deployments which compare the ACSM performance with AMS systems. Data quality and data analysis methods will be presented and areas of current development will also be discussed.

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