Ground-based Measurements of Reactive Gases during MIRAGE-Mex

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Platform: Ground-based
Instrument: SICIMS single channel MS System
Quantities: 1 minute average H_2SO_4 concentrations
Group: NCAR/ACD/POP

We will deploy an instrument to quantify the concentrations of H_2SO_4 using selected ion chemical ionization mass spectroscopy (mentioned in Jim Smith's description of ground-based aerosol characterization measurements). Nitrate ions (NO_3^-) are produced in the lower part of the inlet by the interaction of gas phase nitric acid (HNO_3) with alpha particles produced from Americium-241. The reaction between NO_3^- and H_2SO_4 leads to HSO_4^- ions. The reagent and product ions enter the vacuum system, which has ion optics and differential pumping followed by mass separation using a quadrupole filter and detection with a channel electron multiplier. The ion count ratios for mass 97 (corresponding to HSO_4^-) to mass 62 (corresponding to NO_3^-) are proportional to the H_2SO_4 concentrations entering the inlet. The proportionality coefficient is determined through calibrations of OH, by generating radicals via the UV photolysis of water vapor.

These measurements will address several MIRAGE-Mex scientific objectives, including helping to assess the geographical extent of influence of the MC outflow, and the influence of H_2SO_4 on aerosol nucleation and growth.