

On-line Measurements of Volatile Organic Compounds in the Outflow from Mexico City by Proton-Transfer Ion-Trap Mass Spectrometry (PIT-MS)

Joost de Gouw (Principal Investigator), Joost.deGouw@noaa.gov

Cooperative Institute for Research in Environmental Sciences, University of Colorado and NOAA Earth System Research Laboratory, Boulder, CO

Ray Fall (co-PI)

University of Colorado, Boulder, CO

We will deploy a newly developed PIT-MS (proton-transfer ion-trap mass spectrometry) instrument at the T1 site downwind from Mexico City. PIT-MS is similar to PTR-MS (proton-transfer-reaction mass spectrometry) in that it uses hydronium (H_3O^+) ions to ionize VOCs and mass spectrometry to detect the product ions. In PTR-MS, different VOCs of the same mass cannot be separately measured. In air masses with a complex mixture of VOCs, such as will be encountered in Mexico City, this is an important limitation of the technique. In PIT-MS, on the other hand, different ions of the same mass can be (i) accumulated in the ion trap, (ii) fragmented by increasing the kinetic energy, and (iii) separated by the different fragment ion spectra. PIT-MS thus gives additional chemical information that can be used to solve mass interferences in PTR-MS, or to identify unknown species.

Using the PIT-MS data, we intend to study the emissions and photochemical processing of VOCs from Mexico City. Using suitable hydrocarbon ratios, the degree of photochemical processing of an air mass can be estimated, and this concept can be used to distinguish between direct emissions and in-situ formation. In particular for oxygenated VOCs (ketones, aldehydes, alcohols and acids) there are many open questions regarding their sources and/or atmospheric formation mechanisms. In addition, the mixture of hydrocarbons emitted in Mexico City is expected to be qualitatively different from that in other parts of the world, and it will be of interest to compare the results with those from other studies. Finally, the results will be used to quantify the pool of precursors that is available for the formation of organic aerosol.