

IT-MS and GC-FID Measurements of VOCs at T1: Characterization of Emissions

Joost de Gouw
Daniel Welsh-Bon
Carsten Warneke
William Kuster
Oscar Vargas

Greg Huey

Volatile organic compounds (VOCs) were measured at the T1 site using 2 different methods. Small alkanes and alkenes were measured using an on-line gas chromatography instrument with flame-ionization detection (GC-FID). Aromatic hydrocarbons and oxygenated VOCs were quantified by proton-transfer ion-trap mass spectrometry (PIT-MS), a newly developed instrument based on the commonly used PTR-MS technique that uses an ion trap mass spectrometer for the on-line quantification and identification of VOCs. In addition, a gas chromatographic interface was coupled to the PIT-MS instrument for more detailed analysis of individual samples. The results give insight into which VOCs can be uniquely detected by PTR-MS in Mexico City.

For almost all measured species, a strong diurnal variation was observed with very high mixing ratios at night when VOC emissions accumulated in a shallow boundary layer, and lower mixing ratios during the day when VOCs were mixed in a deeper boundary layer and were removed by photochemistry. Good correlations between most VOCs were observed -even between species with widely different atmospheric lifetimes- and hence the nighttime data are very suitable for the characterization of VOC emissions. Emission ratios of VOCs versus CO are determined from the data, and compared with similar ratios from cities in the U.S. and with emission inventories.