Long-Path-DOAS Long Path Measurements of NO2, HONO, HCHO, Glyoxal, SO2, O3 and aromatic VOC during MCMA-2006

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Two Long-Path-DOAS (Differential Optical Absorption Spectroscopy) instruments were installed at T0 (Instituto Mexicano de Petreoleo). DOAS#1 primarily measured aromatic volatile organic compounds (VOCs) as precursors for secondary organic aerosol (SOA) formation, among other species. DOAS#2 was dedicated to measurement of HOx radical precursors (Glyoxal, HONO, HCHO, O3) among other species. Both instruments used a Xenon-high-pressure lamp as light source and a spectrometer with photo diode array as detector. The time resolution changed between 3 to 25 minutes depending on the visibility.

The DOAS#1 telescope was orientated to two reflector arrays at a COMEX water tower at a distance of 1027 m (2053 m) and another reflector placed at the PEMEX area (440 m). The instrument was running from March 3 to April 1, during which the orientation was switched continuously between the two lightpaths to gain spatial information. Time series and diurnal series from the COMEX direction are presented in this poster. Measured VOCs included benzene derivatives e.g. toluene, styrene, phenol, cresol and xylene, as well as two ring aromatic compounds, e.g., naphthalene and methylnaphthalene. Episodes of remarkably high concentrations of toluene (190 ppb on March 8) and styrene (14.5 ppb on March 23) were observed.

The DOAS#2 telescope was pointing at a reflector array located at the La Raza hospital, 2641 m south of T0 (5282 m total light path). For the first time during a field campaign a new set-up based on fibre optics was tested to couple the light source in the telescope and to receive the light from the reflector. This set-up provides a higher stability of the alignment and improves the spectral characteristics of the light source. The Instrument was working from March 8 to April 1. The NO2 measurement shows a mean daily maximum of 71+/-25 ppb with maximal values of 133 ppb. Glyoxal, a product of VOC oxidation, showed maximum concentrations between 0.5 and 1.4+/-0.2 ppb around 11am (local time).

A particular focus of the combined DOAS setup at T0 was to assess horizontal gradients of species that were measured by both instruments on different spatial scales and directions. While similar values are measured for NO2, SO2 and O3, the concentrations of HONO and HCHO differ significantly. The mean HCHO concentrations are found to be two times higher (22.5 ppb mean daily maximum) in northeast of T0 than in the directions of La Raza reflector in the south (12ppb mean daily maximum).