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Morphology and elemental analysis of fine particles during MILAGRO campaign (case study: T1 site)

R. Mamani-Paco (1), T. Castro (1), E. Herrera (2), B. Trujillo (2) and G. Carabali (1)
(1) CCA-UNAM, Mexico City, Mexico, (2) CIMAV, Chihuahua, Mexico
(mmruben@atmosfera.unam.mx / Fax: 52 55 56160789 / Phone:52 55 56224053)

Measurements of fine particles (five sizes less than 2.5 microns) were made at the Technological University of Tecamac (UTTEC), state of Mexico (T1 site of MILAGRO campaign). The university location (19˚ 43' N Latitude, and 98˚ 58' W Longitude, altitude of 2,340 m.a.s.l.) is to the North of Mexico City Metropolitan Area (MCMA) which has a population of approximately 20 million inhabitants.

Four three-hour periods throughout the day were sampled. The objective was to find out any differences due to time of the day and sources. Sampling was done by placing transmission electron microscope (TEM) grids on the last 5 stages of an 8-stage MOUDI cascade impactor (d_{50}= 1.8 μm, 1.0 μm, 0.56 μm, 0.32 μm, and 0.18 μm). Samples were obtained during early morning (6:00-9:00), noon (11:00-14:00), afternoon (16:00-19:00) and evening (21:00-24:00) conditions.

TEM images of particles were acquired at different magnifications by using a CM 200 Phillips TEM. The morphology of fine particles in each of the five sizes was characterized by using border-based fractal dimension. Particles in smaller size bins tend to show higher departures from sphericity (fractal dimension of 1.3). This situation is closely related to time of the day sampling because of soot mobile sources. Elemental analysis (using EDS) of particles with d_{50}0.18 μm show higher contents of elemental and organic carbon aggregates associated with high fractal dimensions.