Atmospheric Fine Particle Morphology Associated with Size, Elemental Composition, and Time of the Day during MILAGRO Campaign.

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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 (19°43' N Latitude, and 98°58' W Longitude, altitude of 2,340 m.a.s.l.) is a neighboring boundary site located 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 particle morphology differences due Mexico City (MC) influence and time of the day. Aerosol sampling was done by placing transmission electron microscope (TEM) grids (Cu) 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-EDAX system. The morphology of fine particles in each of the five sizes was studied by using border-based fractal dimension. Particles sampled during a day under MC influence showed not much variability in morphology for the considered sizes and time of the day. This suggests the presence of more compact particles in smaller sizes (d_{50}= 1.8 μm). The presence of higher numbers compact particles can be attributed to processes such as aerosol aging and secondary aerosol formation. Elemental analysis (using EDS) of particles with d_{50}= 0.18 μm showed a higher content of C. A trace of sulfur may indicate ammonium sulfate coating.

Aerosol morphology showed some variability with size and time of the day for particles sampled during a day of little MC plume influence. During early morning conditions smaller particles (d_{50}= 1.8 μm) presented more irregular features resulting in a higher average fractal dimension. Elemental analysis of particles with d_{50}= 0.18 μm resulted in the presence of C, Si, Fe, K, and Co. This may indicate influence of industrial emissions (p.g. Tizayuca Industrial Park located to the North of T1 site).