MILAGRO

Megacity Initiative - Local and Global Research Observations

MARCH 1-31
2006

GROUND-BASED MEASUREMENTS: SUPERSITES

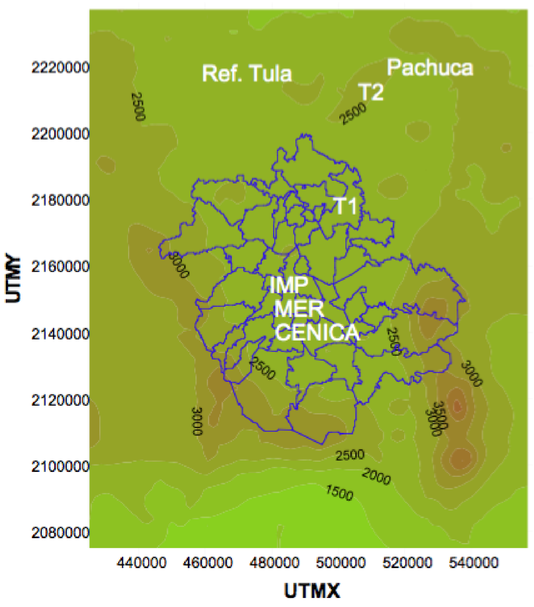
The MILAGRO Campaign selected three supersites to conduct measurements in order to characterize the chemical/physical transformations and the ultimate fate of pollutants exported from urban areas.

The supersites are: Mexican Petroleum Institute (IMP-T0), Technological University of Tecámac in the State of Mexico (T1) and La Bisnaga Ranch in Hidalgo (T2). A large number of scientists will gather at each site to characterize the atmosphere of the MCMA. The IMP, for example, will accommodate more than 100 scientists.

Scientific Goals of the MILAGRO Campaign at the Supersites

- To characterize secondary aerosol precursor gases at different sites using high time resolution state-of-the-art instruments.
- To evaluate the impact of atmospheric pollution from MCMA at a regional level (areas bordering Mexico City), giving special attention to particles in the atmosphere. In order to accomplish this, simultaneous measurements of ultrafine particles PM2.5, PM10 and TSP will be conducted at the three supersites.
- To evaluate the total concentration, gas and particulate phases of mercury at T0 and T1 sites.
- To quantify the Tula's refinery apportionment to the total particles and gaseous emissions associated to the greenhouse emissions, and to assess the local and regional environmental impacts.
- To characterize the chemical and physical composition of PM2.5 particles in the MCMA as well as their diurnal variations. To identify each of the volatile organic compounds (VOCs) obtained from samples taken from industrial stacks located in Mexico City.
- To measure the vertical profiles of ozone, VOCs, and meteorological parameters using tethered balloons and Lidar at the T0 supersite.
- To provide meteorological support for the MILAGRO Campaign. This includes analysis of plume dispersion from the Mexico City Basin for pre-campaign planning, campaign forecasting and post-campaign analysis.
- To study the health impacts of atmospheric pollutants.

T0: Mexican Petroleum Institute (IMP)



T1: Technological University of Tecámac

T2: La Bisnaga Ranch in Hidalgo

Campaign Studies

Equipment with the latest technological advances will be installed for the continuous measurements of gas or aerosol atmospheric components. Meteorological and radiative parameters will also be measured.

Gas phase chemical species

Photochemistry products: O3, NO2, HONO, VOC, HCHO, NH3, HNO3, glyoxal

Free Radicals: HOx and OH

Hydrocarbons: volatile organic compounds and total polyaromatic hydrocarbons, as well as their chemical speciation

Organic Acids: total and chemical speciation

Aldehydes: formaldehyde, acetalhyde and others

Vertical profiles: NO2, SO2, HCHO, O3, VOC

Total particle and gas phase mercury

Particles and Aerosols

Mass Concentration: PM2.5, PM10

Chemical composition: organic and elemental carbon, metals, ions, polyaromatic hydrocarbons, mercury, organic acids

Isotopes: 14C, 40K, 210Pb, 7Be, 210Po, 210Bi

Morphology: morphology of particles will be determined using techniques such as SEM and electronic microscopy, as well as its chemical composition

Microphysical properties: cloud condensation nuclei, distribution by size (10 to 400 nm), nanoparticles, hydroscopicity, water content

Optical properties: dispersion and absorption coefficient as a function of wavelength, optical depth

Vertical profiles: total aerosols

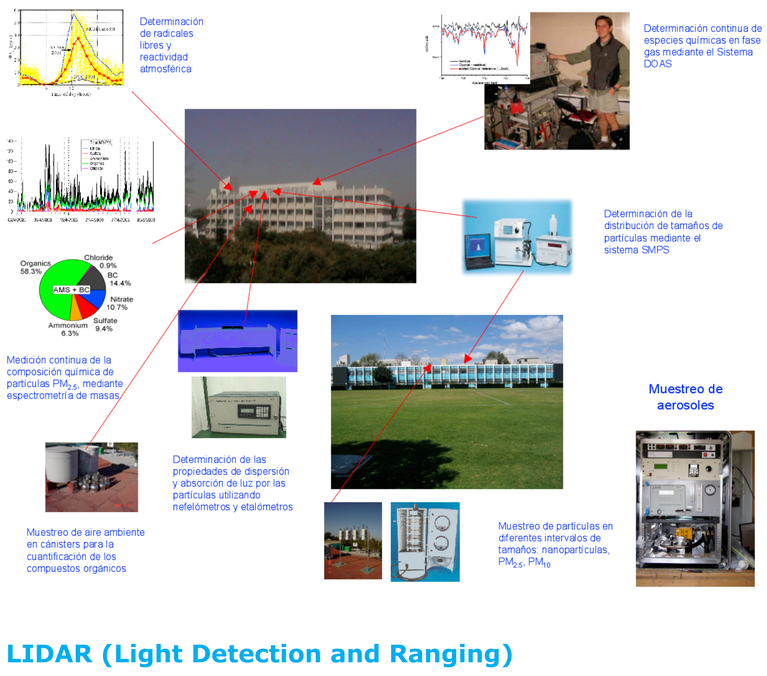
Health impact: oxidation potential, DNA damage potential, personal exposure to suspended particles

Meteorological and Radiation Parameters

Solar radiation: total and diffuse solar radiation, total and diffuse UV

Meteorological parameters: temperature, relative humidity, precipitation, wind velocity and direction (three components)

Vertical profiles: temperature, relative humidity, atmospheric pressure, wind velocity and direction, height of a cloud base

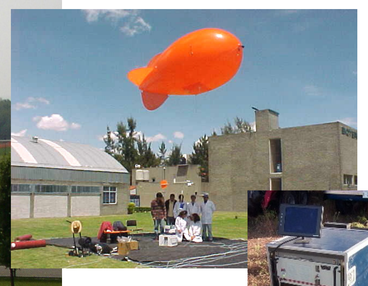


Measurements of meteorological and radiative parameters

Multifilter shadow-band radiometer

Medición de variaibles meteorológicas

Globos cautivos CENICA y NCAR



sodar

Antena de radar del perfilador de viento

Perfilador de viento y radiometro Universidad de Alabama

LIDAR (Light Detection and Ranging)

During the MILAGRO Campaign, a Lidar (a type of radar that measures light dispersion from a laser in the atmosphere) will be used to conduct the characterization of aerosols and their concentrations at different altitudes. These measurements will help to better understand how atmospheric particles transform and affect solar radiation as it reaches the Earth's surface.

Lidar: Universidad de Iowa

Molina Center for
Energy and the Environment
http://mce2.org