The MILAGRO Campaign is an international scientific collaborative effort focused on the study of the local, regional and global impact of air pollution in a megacity, using as a case study the Mexico City Metropolitan Area (MCMA) and its surrounding areas.

Why select Mexico City Metropolitan Area as the case study?

The Mexico City Metropolitan Area was selected as a case study for the MILAGRO Campaign for the following reasons:

• Tropical latitude similar to other megacities – MCMA receives a large amount of incoming solar radiation all year long making its atmosphere extremely active photochemically, which helps to determine the transformation of atmospheric pollutants.

• The existence of urban and air quality measurement requirements.

• Previous experiences in several projects with excellent scientific collaboration between Mexican and international scientists.

• The existence of optimal logistical infrastructure.

• Information from previous research campaigns, among them the most recent in 2003 (MCMA-2003 Campaign).

Goals of the MILAGRO Campaign

The overall goals of the MILAGRO Campaign are:

• To study the transformation and transport of air pollutants generated by megacities, using as case study the Mexico City Metropolitan Area, and

• To analyze the local, regional and global impacts of these pollutants through ground-based measurements and the use of aircraft and satellites, other gases, aerosols, meteorology, solar radiation, and meteorological and air quality models.

This will result in the compilation of a large amount of information on the chemical composition of the aerosols, on the chemical and physical state of the atmosphere in a megacity and its impacts at local, regional and global levels.

The MILAGRO science team have spent the past two years designing the four mission components so that they come together into a comprehensive measurement plan. This plan takes into account the types of instruments, sample-frequency and geographical coverage of the project, helping to leverage the contributions of the participating agencies and institutions in an optimal and non-overlapping manner.

The aircraft measurement teams have developed concerted flight plans for the six participating aircraft in order to characterize the spatial extent of the plume, quantify gas-aerosol-radiation processes in the evolving plume, and ensure high data quality by inter-comparison flights. Aircraft and ground-based measurement teams have selected three supertemporal (T0, T1 and T2) to characterize the chemical/physical transformations and the ultimate fate of pollutants exported from urban areas.

Expected Benefits

The results derived from the MILAGRO Campaign will have considerable scientific and technological significance. Moreover, the environmental effort of the project will be used to improve air quality policies.

• The MILAGRO 2006 Campaign is the first assessment of regional air quality of the MCMA that will consider the major factors that affect this issue.

• It will provide a better understanding of the relative importance of different emissions sources (urban, biomass burning, natural).

• It will contribute to the improvement of meteorological and air quality models.

• It will help acquire a better understanding of processes that transform and remove pollution in the MCMA.

• It will provide education for students participating in the campaign to expand and consolidate their knowledge by having access to scientific data and state-of-the-art technology.

• It will promote further collaboration among the scientific officials and technical personnel from participating state governments.

MILAGRO: Monitoring Sites

The campaign will be conducted with a wide range of instruments at ground sites, on aircraft, and satellites. The three main ground locations are: Mexican Petroleum Institute ("T1") in the MCMA, "T2" in the State of Mexico, and "T2" in Tecámac, north of Toluca in the State of Hidalgo ("T2")

The designations "T0", "T1" and "T2" refer to the transport of urban plume between different points in space and time. Ground sites are ideal for concurrent detailed measurements of a large number of species and properties. At each of these sites, standard monitoring and specialized equipment will be installed. 

At some sites, incinerators and ballasts with instruments to measure meteorological parameters, ozone, and hydrocarbons will be added. 

Additional platforms in or near Mexico City include mobile vans containing scientific laboratories, as well as mobile and stationary upward-looking lasers (lidars). The measurements will be made over a period of 30 days, 24 hours a day.

Environmental Activities

The MILAGRO Campaign recognizes the need to contribute to the education and training of young investigators, to raise scientific awareness and to disseminate the results of the measurement campaign to the scientific community as well as policy makers and the general public.

With this in mind, a series of education and outreach activities are planned. The campaign will "tie out" in parallel to the scientific activities conducted by MILAGRO researchers working at the field sites. These activities include poster exhibits, educational presentations and talks with students, professors and the general public, guided tours of the measurement sites, satellite information and outreach, scientific workshops on the use of the space equipment deployed in MILAGRO, and a poster and essay contest for junior and senior high school students on atmospheric pollution.

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