



PRESS RELEASE

THE MCMA-2006 CAMPAIGN AS PART OF THE MILAGRO PROJECT

The MILAGRO (**Megacity Initiative: Local and Global Research Observations**) Campaign will take place in March 2006 as 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 and its surrounding areas.

The campaign consists of four coordinated field campaigns:

- "MCMA-2006" (Mexico City Metropolitan Area - 2006)
- "MAX-Mex" (Megacity Aerosol Experiment in Mexico City)
- "MIRAGE-Mex" (Megacity Impacts on Regional and Global Environments)
- "INTEX-B" (Intercontinental Chemical Transport Experiment – Phase B),

"MCMA-2006" (Mexico City Metropolitan Area - 2006), led by the Molina Center for Strategic Studies on Energy and the Environment (MCE2) in California, is focused mainly on the Mexico City Metropolitan Area.

The MCMA-2006 component will examine pollution emissions and boundary layer concentrations within the Mexico City Basin through the measurement of aerosols, volatile organic compounds (VOCs) and other gases, meteorology, and solar radiation in different parts of the Mexico City Metropolitan Area, at the supersite at Instituto Mexicano del Petróleo and a flux tower located at city center, in combination with a highly capable mobile laboratory from Aerodyne Research Inc., and several fixed units deployed throughout the MCMA at representative urban and boundary sites.

This component will include the participation from many Mexican, US and European institutions. A scientific committee led by Dr. Luisa T. Molina oversees the MCMA-2006. The participating institutions for this component as well as the members of the scientific committee are listed below.

Mexican institutions:

- Agencia de Protección al Medio Ambiente y Recursos Naturales –Gobierno del Estado de Nuevo León (APMARN)
- Centro Mario Molina (CMM)



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- Centro Nacional de Investigación y Capacitación Ambiental (CENICA-INE)
- Centro de Investigación en Materiales Avanzados, S.C. (CIMAV)
- Centro de Educación y Capacitación para el Desarrollo Sostenible (CECADESU-SEMARNAT)
- Colegio Alemán
- Comisión Ambiental Metropolitana (CAM)
- Comisión de Recursos Naturales y Desarrollo Rural-Gobierno del Distrito Federal (CORENA)
- Consejo Estatal de Ecología (State of Hidalgo)
- Consejo Estatal de Protección al Ambiente (State of Veracruz)
- Consejo Nacional de Ciencia y Tecnología (CONACyT)
- Dirección de Ecología-Presidencia Municipal de Salamanca, Guanajuato
- Dirección General de Aeronáutica Civil (DGAC –SCT)
- Fuerza Aérea Mexicana (FAM –SEDENA)
- Fundación México-Estados Unidos para la Ciencia (FUMEC)
- Instituto de Ecología de Guanajuato
- Instituto de Investigaciones Eléctricas (IIE)
- Instituto Mexicano de Tecnología del Agua (IMTA)
- Instituto Mexicano del Petróleo (IMP)
- Instituto Nacional de Cancerología (INC)
- Instituto Nacional de Ecología (INE)
- Instituto Nacional de Estadística, Geografía e Informática (INEGI)
- Instituto Nacional de Investigaciones Nucleares (ININ)
- Instituto Nacional de Salud Pública (INSP)
- Instituto Tecnológico y de Estudios Superiores de Monterrey (Campus: Monterrey and State of Mexico)
- Petróleos Mexicanos (PEMEX)
- Secretaría de Comunicaciones y Transportes (SCT)
- Secretaría de Educación Pública (SEP)
- Secretaría de Gobernación (SEGOB) – Instituto Nacional de Migración (INM)
- Secretaría de Hacienda y Crédito Público (SHCP) – Administración General de Aduanas (AGA)
- Secretaría de la Defensa Nacional (SEDENA)
- Secretaria de Desarrollo Sustentable-Gobierno del Estado de Querétaro
- Secretaría de Marina (SEMAR)
- Secretaria de Medio Ambiente del Gobierno del Distrito Federal (SMA-GDF)
- Secretaria de Medio Ambiente del Gobierno del Estado de México (SEGEM)
- Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)
- Secretaría de Relaciones Exteriores (SRE)
- Servicio Meteorológico Nacional (SMN)
- Servicios a la Navegación en el Espacio Aéreo Mexicano (SENEAM)
- Sindicato Nacional de Telefonistas de la República Mexicana
- Universidad Autónoma de San Luis Potosí (UASLP)
- Universidad Autónoma del Estado de Morelos (UAEM)
- Universidad Autónoma Metropolitana (UAM)
- Universidad Nacional Autónoma de México (UNAM)
- Universidad Tecnológica de Tecámac (State of Mexico)
- Universidad Veracruzana (State of Veracruz)

Non-Mexican institutions:

Aerodyne Research, Inc. (USA)



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Argonne National Laboratory/Department of Energy (USA)
Chalmers University (Sweden)
Consejo Superior de Investigaciones Científicas (Spain)
Desert Research Institute [DRI] (USA)
Environmental Protection Agency [EPA] (USA)
Goteborg University (Sweden)
Heidelberg University (Germany)
Indiana University (USA)
Massachusetts Institute of Technology [MIT] (USA)
Molina Center for Strategic Studies in Energy and the Environment [MCE2] (USA)
Montana State University (USA)
National Science Foundation [NSF] (USA)
Paul Sherrer Institute. (Switzerland)
University of California Los Angeles [UCLA] (USA)
University of California at San Diego [UCSD] (USA)
University of Colorado (USA)
University of Iowa (USA)
University of Leipzig (Germany)
University of Wisconsin (USA)
Virginia Tech (USA)
Washington State University (USA)

Scientific Committee (MCMA2006)

Lead Scientist:

Luisa T. Molina (Molina Center for Energy and the Environment /MIT)

Scientific Committee:

Ernesto Caetano (UNAM)
Beatriz Cárdenas (CENICA)
Telma Castro (UNAM)
Agustín García (UNAM)
Ana Patricia Martínez (CENICA)
Mireya Moya (UNAM)
Gustavo Sosa (IMP)
Rafael Ramos (GDF-SMA)
José Luis Jiménez (University of Colorado)
Charles Kolb (Aerodyne Research Inc.)
Brian Lamb (Washington State University)
Nancy Marley (Argonne National Lab)
Mario Molina (UCSD/Centro Mario Molina)

Logistical coordinator in Mexico:

Juan Carlos Arredondo (Molina Center for Energy and the Environment)

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MILAGRO CAMPAIGN

The MILAGRO (**Megacity Initiative: Local and Global Research Observations**) campaign will take place in March 2006 as 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 and its surrounding areas.

During the month of March 2006, the **MILAGRO** campaign will bring an international research team of more than 400 researchers and students from more than 120 Mexican and worldwide institutions that will work at the measurement sites installed within the Mexico City Metropolitan Area (Mexico City and State of Mexico), and in the states of Hidalgo and Veracruz. Nearly 80 Mexican investigators from national universities and research centers in collaboration with Mexican government agencies will join the campaign efforts.

The goal of MILAGRO is to study the transformation and transport of air pollutants generated by megacities, using as case study the Mexico City Metropolitan Area and analyze the impacts of these pollutants at a local, regional and global scale by way of ground-based measurements as well as through the use of aircraft and satellites, and other gases, aerosols, meteorology, and solar radiation, and using meteorological and air quality models. This will result in the compilation of a great quantity of information, until now unknown, regarding the physical and chemical processes of the atmosphere in a megacity and its impacts at local, regional and global levels.

The four campaigns that integrate the MILAGRO campaign will be carried out simultaneously and will include coordinated measurements from aircraft and ground supersites with the support of modeling and satellite observation activities. For the last two years, scientists participating in MILAGRO have been designing these four components to be coordinated in a unique measurement plan, which includes the types of instruments, sample-frequency and geographical coverage of the project, in order to ensure that the contributions from the participating agencies and institutions are carried out optimally and without the duplication of activities.



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For instance, the groups focused on taking airborne measurements have developed flight plans for the six participating airplanes in such a way that they may be characterized by size, concentration and extension of the plume of pollutants and their chemical processes, all in all to make sure that high quality data is obtained which allows internal comparison between flights. At the same time, the groups that will conduct ground measurements have selected three supersites (T0, T1 and T2) to characterize the chemical and physical transformations and the final destination of the pollutants exported from the urban sites to other regions.

The MILAGRO measurements will take place **March 1-30, 2006**. The measurements will be conducted using a wide range of instruments at ground sites, on six aircraft, and nine satellites (three of which will be greatly used, AURA, AQUA, TERRA).

The three supersites are the Instituto Mexicano del Petróleo (“**T0**”), the Universidad Tecnológica de Tecámac in the State of Mexico (“**T1**”) and Rancho La Bisnaga, north of Tizayuca in the State of Hidalgo (“**T2**”).

The designations “T0”, “T1”, and “T2” refer to transport –in relation to time- of the urban plume from the megacity to neighboring regions. Ground sites are ideal for continuous detailed measurements of a large number of pollutants and their physical and chemical properties. At each of the sites, standard monitoring and specialized equipment will be installed. At some sites radiosondes and tethered balloons with instruments to measure meteorological parameters, ozone and volatile organic compounds will be released.

Additional platforms in or near Mexico City include mobile and stationary balloons, vans containing mobile laboratories, laser spectrometers, (Lidars). The measurements will be made over a period of 30 days, 24 hours a day.

Six instrumented research aircraft will participate in MILAGRO: five will be based in Veracruz, Mexico, and one in Houston, Texas. These airborne measurements will provide information about the atmosphere over a large region that covers the Mexico City Metropolitan Area all the way to the Pacific Ocean and the Gulf of Mexico at various altitudes. Satellite-based instruments will peer down into the atmosphere to provide even larger geographical coverage.



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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
- The existence of reliable urban and air quality measurement records
- Previous experience with excellent scientific collaboration
- The existence of optimal logistical infrastructure
- Information from previous research campaigns, among them the most recent in 2003.

The MCMA-2003 study provided scientific information that was fundamental in the planning of the larger MILAGRO Campaign. Specifically, it showed that the atmosphere of the MCMA is extremely active photochemically and is ideally suited for understanding the atmospheric chemistry of tropical megacities. MILAGRO will provide even more comprehensive measurements inside the metropolitan area, as well as the first ever measurement of how much pollution extends outside the MCMA.

Education and Outreach program of the MILAGRO Campaign

The MILAGRO Campaign recognizes the need to contribute to the education and training of young investigators, to raise social awareness toward atmospheric pollution problems, 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, the MILAGRO organizers have set up a series of education and outreach activities to be carried out in parallel to the scientific activities by Mexican and foreign researchers working at the field sites.

A few of the activities that have been organized involve poster exhibits, presentations and talks with students, professors and the general public, guided tours of the measurement sites, web-based information, and specialized workshops on the function and use of the equipment being used in MILAGRO.

Poster exhibit sites:

Museo UNIVERSUM, Ciudad Universitaria
Plaza Juárez, Centro Histórico, Mexico City
Instituto Mexicano del Petróleo
Universidad Tecnológica de Tecámac



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Universidad Veracruzana
Universidad Autónoma Metropolitana
Túnel de la Ciencia, Sistema de Transporte Colectivo METRO, Mexico City

Components of the MILAGRO Campaign

Below is a description of each of the four components of the MILAGRO Campaign:

MCMA-2006 (Mexico City Metropolitan Area - 2006)

The Mexico City Metropolitan Area – 2006 (**MCMA-2006**) campaign is led by Dr. Luisa T. Molina of the Molina Center for Energy and the Environment in California (MCE²) with funding from several institutions such as the Secretaría del Medio Ambiente through the Instituto Nacional de Ecología, the Consejo Nacional de Ciencia y Tecnología, the Comisión Ambiental Metropolitana (CAM) from Mexico, the United States National Science Foundation (NSF), the Department of Energy (DOE) and several European institutions.

The overall purpose of MCMA-2006 is to strengthen the scientific base for the design and evaluation of policies intended for the improvement of air quality in the MCMA by developing scientific information that helps to better understand the generation processes of pollutants in the MCMA, their dispersal, transport and transformation in the atmosphere, the exposure patterns of the general population to these pollutants, and the effects on human health. Similar to previous campaigns led by Dr. Luisa T. Molina, the findings relevant to the design of policies will be identified and presented to the representatives of the Mexican government.

MAX-Mex (Megacity Aerosol Experiment in Mexico City)

The Megacity Aerosol Experiment (**MAX-Mex**) campaign is led by Dr. Jeffrey Gaffney from Argonne National Laboratory, operated by the U.S. Department of Energy (DOE), and is funded by the DOE Atmospheric Science Program (ASP). The ASP program is focused on understanding the role of aerosols in the radiative forcing of the atmosphere and is part of the DOE's Climate Change Research Division efforts to reduce uncertainties in global climate modeling. The MAX-Mex campaign will characterize aerosol formation and changes in aerosol composition, size distribution, light scattering coefficient, absorption coefficient, optical depth, soot-specific absorption, and radiative fluxes at selected vertical and horizontal locations in the outflow from a well-characterized urban core.

The planned field study will focus on chemical, physical, and optical characterization of the aerosols, on aerosol transformations including aging of the black carbon during outflow into the region, and on the effects of the megacity aerosol plume on the regional radiative balance in and near this megacity source.



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The MAX-Mex program will use two aircraft: A well-equipped airplane, the DOE Gulfstream aircraft (G-1), to measure aerosol properties and precursor gas contributions. An additional aircraft (King Air) will deploy a Lidar and provide two-dimensional (height-distance) information on aerosol distribution and plume extents. In addition, different types of equipment will be installed at the three ground-based supersites, again focusing on aerosol emission and formation, properties, chemical and physical transformations, and effects on climate.

MIRAGE-Mex (Megacity Impacts on Regional and Global Environments)

The Megacity Impacts on Regional and Global Environments (**MIRAGE**) program is a multidisciplinary activity led by Dr. Sasha Madronich of the National Center for Atmospheric Research (NCAR). The project is funded primarily by the U.S. National Science Foundation (NSF) with additional support from NASA. The overall goal of MIRAGE is to increase the understanding of how the world's megacities affect regional and global air chemistry, and how this in turn can influence weather and climate.

To achieve these objectives, an extensive series of observations of the chemical and physical state of the atmosphere in the region surrounding Mexico City will be made during MILAGRO. The NSF C-130 aircraft will carry a payload of state-of-the-art scientific instruments and, flying from its base in Veracruz, will sample air at different distances from Mexico City to measure how gases and particles "age" during transport, specifically tracking those chemical, physical, and optical properties that have the potential to affect air quality, weather, and climate on large geographic scales. An additional aircraft (Twin Otter, also based in Veracruz) will conduct studies of fires and their effect on the local and regional composition of the atmosphere. Other MIRAGE-Mex researchers will be located at the T1 site at the Universidad Tecnológica de Tecámac.

INTEX-B (Intercontinental Chemical Transport Experiment – Phase B)

The Intercontinental Chemical Transport Experiment – Phase B (**INTEX-B**) is led by Dr. Hanwant Singh of the U.S. National Aeronautics and Space Administration (NASA). This component is funded by NASA with additional support and contributions from NSF and international partner countries.

The INTEX-B campaign will emphasize the regional-to-global aspect of MILAGRO with observations from two aircraft, a DC-8 and a J-31, as well as satellites. The larger DC-8 aircraft will provide comprehensive observations of chemistry and aerosols using both direct air sampling and laser remote sensing while the smaller J-31 will focus exclusively on aerosols and their radiative impacts. Operating out of Houston, Texas, the DC-8 will interact with other MILAGRO aircraft to locate and sample pollution associated with the Mexico City Metropolitan Area after which it will extend its observations downstream over the Gulf of Mexico. Operating out of Veracruz, the J-31 will seek to examine the impact of aerosols close to Mexico City pollution sources.

The DC-8 and J-31 will perform their flights in coordination with NASA satellites (Aura, Aqua, and Terra) in order to provide ground truth and function as a bridge between the wealth of data resulting from the MILAGRO observations and the broad regional-to-global perspective from the satellites.



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Contact Information for the MILAGRO Campaign

MCMA-2006

Mexico City Metropolitan Area – 2006

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<http://mce2.org/megacities/fieldcampaign2006/>

MAX-Mex

Megacity Aerosol Experiment – Mexico

Lead Scientist: Dr. Jeff Gaffney,
Argonne National Lab/Department of Energy (ANL/DOE)
<http://www.asp.bnl.gov/MAX-Mex.html>

MIRAGE-Mex

Megacity Impacts on Regional and Global Environments-Mexico

Lead Scientist: Dr. Sasha Madronich,
National Center for Atmospheric Research/National Science Foundation (NCAR/NSF)
<http://mirage-mex.acd.ucar.edu/>

NASA-INTEX-B

Intercontinental Chemical Transport Experiment – Phase B

Lead Scientist: Dr. Hanwant Singh,
National Aeronautics and Space Administration/Ames Research Center (NASA/ARC)
<http://www.espo.nasa.gov/intex-b>

MILAGRO Websites

<http://mce2.org/megacities/fieldcampaign2006/>

<http://www.joss.ucar.edu/milagro/>

<http://www.asp.bnl.gov/MAX-Mex.html>

<http://mirage-mex.acd.ucar.edu/>

<http://www.espo.nasa.gov/intex-b/>