R. J. Yokelson - México airborne (2006) & ground-based (2007) campaigns

2006 Field Measurements in México - México Photo Galleries

Summary - As part of MIRAGE (Megacities Impact on Regional and Global Environment) during March 2006, we flew an instrumented DeHavilland Twin Otter for 67 hours in southern México. We measured the emissions from 63 fires representing many types of biomass burning. The fires included a planned research fire carried out by a team of Mexican and US scientists. We also sampled urban pollution and the interaction between urban pollution and biomass burning. The science team and instrumentation for the Twin Otter were as follows:

1. *Bob Yokelson and Ted Christian (U Montana)*
    - Airborne FTIR (AFTIR) measuring trace gases: water vapor, ozone, carbon dioxide (CO2), carbon monoxide (CO), methane, nitric oxide, nitrogen dioxide, ethylene, acetylene, methanol, acetic acid, formaldehyde, formic acid, ammonia, and hydrogen cyanide.
2. *Sean Urbanski, Cyle Wold, Wei Min Hao (US Forest Service)*
    - GPS - aircraft latitude, longitude, altitude
    - Nephelometer - aerosol mass/volume concentration by light scattering
    - LiCor - CO2
    - Whole air sampling (WAS) in stainless steel canisters analyzed by GC/FID for CO2, CO, hydrocarbons
3. *Eliot Atlas (U Miami)*
    - WAS in stainless steel canisters analyzed by GC/MS for CO, hydrocarbons, halocarbons
4. *Peter Buseck and Koji Adachi (Arizona State U)*
    - MPS-3 cascade impactors for TEM grids analyzed by particle microscopy for elemental composition and structure of individual aerosol particles
5. *Darin Toohey and Marsha Fisher (U Colorado Boulder)*
    - Ultra-High Sensitivity Aerosol Spectrometer (UHSAS) fine particle size distribution
    - LiCor - CO2

2007 Field Measurements in México - México Photo Galleries

* *Summary* - In Spring, 2007, with colleagues from Centro Nacional de Investigación y Capacitación Ambiental (CENICA) , the Molina Center for

Energy and the Environment (MCE2) , the University of Washington College of Forest Resources (UW-CFR) , and El Centro de Investigaciones en Ecosistemas (CIEco) , we sampled the following relatively uncharacterized biomass burning emissions sources in central México with a variety of instrumentation: wood cooking fires in rural kitchens, earthen charcoal-making kilns in remote mountainous areas, brick-making kilns in semi-urban areas, garbage burning in rural and semi-rural landfills, and crop residue burning. The results from that study are currently under analysis. The main participants were:

1. *Bob Yokelson and Ted Christian (U Montana), Ernesto Ismael León Díaz (CENICA)*
    - Land-based FTIR (LaFTIR) measuring trace gases: water vapor, carbon dioxide (CO2), carbon monoxide (CO), methane, ethylene, acetylene, propylene, methanol, acetic acid, formaldehyde, formic acid, ammonia, and hydrogen chloride.
    - Particle instruments: nephelometer (Radiance Research M903) and MIE DataRam4 sampling concurrently with a Licor 7000 CO2 instrument for exact correlations between PM and trace gases.
2. *Beatriz Cárdenas González, Salvador Blanco Jimenez, Henry Wörhnshimmel, and José Juan Felipe Ángeles García (CENICA)*
    - Extensive and detailed communication with local, state, and federal authorities throughout central México to obtain permissions and ensure opportunities to sample all of the source types.
    - Particle and trace gas sampling using Air Metrics MiniVols and stainless steel canisters.
    - Quartz and Teflon filter analysis for PM mass, elemental/ organic carbon, and trace elements.
3. *Ernesto Alvarado (U Washington) and Josè Marìa Michel Fuentes*
    - Characterize fuel type, quantify consumption and combustion efficiency.
    - Communicate with local authorities and citizens, English/ Spanish translation.
4. *Luisa T Molina and Rodrigo González-Abraham (MCE2)*
    - Portable instruments to measure total gaseous Hg (Tekran) and particulate PAH (EcoChem).
5. *Omar Masera (CIEco, GIRA) and Cynthia Armendariz Arnez (UNAM)*
    - Provide a controlled environment for emissions sampling of improved and unimproved cook stoves in the outdoor laboratory maintained by GIRA (Grupo Interdisciplinario de technologia Rural Apropriada).
    - Arrange sampling opportunities of wood cooking fires in rural

kitchens.