Collaborative Research: Organic Trace Gas Studies from Whole-Air Sampling of the Impact of Megacities and Intercontinental Transport on Regional and Global Environments

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This project supports measurements of hydrocarbons, halocarbons, sulfur compounds, organic nitrates, and selected oxygenated volatile organic compounds (VOCs) using airborne and ground-based whole air sampling (WAS) and subsequent analysis with gas chromatography/mass spectrometry/flame ionization detection/electron capture detection. Measurements will be carried out onboard the NCAR C-130 aircraft, and from one ground-site near Mexico City. These measurements will contribute both to MIRAGE-Mex (Megacity Impacts on Regional and Global Environment) and IMPEX (Intercontinental and Megacity Pollution Experiment).

The airborne measurements will be part of an integrated instrument payload to examine the extent and persistence of the Mexico City pollution plume into the regional atmosphere, to study the reactive chemistry of Mexico City emissions in terms of oxidant formation and gas-particle processes, to understand the transformation and partitioning of reactive nitrogen, and to evaluate the effects and feedbacks of the chemical and aerosol emissions and transformations on the regional radiative budget. Monitoring changes of organic gases of different reactivity, including the formation and loss of second generation oxidation products) are necessary to test understanding of the chemical reactivity of the urban plume and to test models of secondary organic aerosol formation and growth. The ground-based measurements in the Mexico City area will be part of a suite of proposed measurements that will help define the initial chemical boundary conditions and early photochemical processing of emissions from the metropolitan area.

The IMPEX portion of the deployment will focus on studying the impact of intercontinental transport of pollutants from Asia to the North American continent. For that purpose, the C-130 will be stationed in or near Seattle, WA, and carry out research flights coordinated with the NASA DC-8 aircraft.

This project will provide educational opportunities for several graduate students. The project will foster international exchange of technical expertise and educational opportunities that will help train future scientists internationally.