ESRL Scientists Studying Cloud/Aerosol Interactions In National Field Program

31 July, 2007

Global Monitoring Division - **ESRL-GMD**
This story entered on 13th Jun, 2007 11:55:32 AM PST

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A month-long, multi-agency, Cumulus Humilis Aerosol Processing Study (CHAPS) began on June 1, focused on how aerosol particles affect cloud properties in the skies over Oklahoma. Clouds can affect aerosol properties by preferentially scavenging some types of particles into cloud drops while leaving others behind. This scavenging alters the overall composition and size of the remaining aerosol which affects direct aerosol radiative forcing, one of the largest remaining unknowns in understanding and modeling the radiative properties of clouds. Of particular interest in the CHAPS study is how aerosol and cloud properties will change downwind of a mid-size city (Oklahoma City), compared to nearby control areas much less influenced by urban emissions.

Background: For seven years, ESRL and the U.S. Department of Energy have been conducting twice weekly flights of an instrumented Cessna aircraft above the DOE Southern Great Plains Atmospheric Radiation Monitoring (ARM) site in central Oklahoma to characterize the ambient atmospheric aerosol. Building on this unique data set, the CHAPS program uses the DOE G-1 aircraft to obtain detailed measurements of aerosols and trace gases above, below, and within clouds related to the ARM site. In addition, a NASA King Air aircraft flies high above the G-1 to map out the aerosol and cloud distributions that the G-1 is sampling. The DOE aircraft carries a specialized cloud sampler supplied and operated by NOAA ESRL, along with a duplicate of the suite of instruments that NOAA ESRL operates on the Cessna and at the SGP site. The G-1 also carries a NOAA ESRL ozone monitor, as does the Cessna.

Significance: CHAPS is occurring in tandem with a larger Cloud and LAnd Surface Interaction Campaign (CLASIC) which aims to increase understanding of how land surface processes (e.g., land use) influence the build up of cumulus clouds which in turn affect cloud, radiative and hydrologic cycles. Both studies are interested in details about cloud formation, microphysics, aerosol, and radiative processes but are approaching the research with different and complementary tools so as to better achieve the overall goals of the programs – understand cloud processes in relation to climate related radiative balance in the atmosphere.

In total there will be eight aircraft participating along with multiple ground based sites. NOAA is coordinating the measurements of aerosol radiative properties on all the CHAPS and CLASIC aircraft and ground sites. Satellite data will also be used for data analysis. The aircraft from both the CHAPS and CLASIC programs will be flying in coordinated patterns to evaluate and calibrate satellite measurements.

Two websites:
CHAPS: http://asp.labworks.org/index.stm
CLASIC: http://science.arm.gov/clasic/

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