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Atmospheric Chemistry Observations & Modeling Laboratory

ACOM Seminar

Holistic Interactions of Shallow Clouds, Aerosols, and Land-Ecosystems (HI-SCALE) Campaign: Objectives, Measurement Strategy, and Preliminary Findings

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This talk describes the objectives, measurement strategy, and preliminary findings from the Holistic Interactions of Shallow Clouds, Aerosols, and Land-Ecosystems (HI-SCALE) campaign conducted in May and September of 2016 near the DOE's Atmospheric Radiation Measurement (ARM) Southern Great Plains (SGP) site in Oklahoma. Current shallow and deep convective cloud parameterizations used by regional and global models contain uncertainties resulting from insufficient coincident data that couples cloud macrophysical and microphysical properties to inhomogeneity in land use and ecosystems, boundary layer turbulence, and aerosol properties. Rather than targeting a narrow set of processes, the goal of the HI-SCALE campaign was to provide a detailed set of aircraft and surface measurements needed to obtain a more complete understanding and improved parameterizations of the lifecycle of shallow clouds. Aerosol and aerosol precursor measurements on the research aircraft included a High Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS), a single particle mass spectrometer (mini SPLAT), various size distribution instruments, a cloud condensation nuclei (CCN) particle counter, a chemical ionization mass spectrometer (CIMS), as well as O_3, SO_2, NO, NO_2, and CO instruments. Similar measurements were collected at the surface. The sampling was done in two periods, one in the spring and the other in the late summer to take advantage of variations in the "greenness" for various types of vegetation, new particle formation, anthropogenic enhancement of biogenic secondary organic aerosol (SOA), and other aerosol properties.

Preliminary findings using the HI-SCALE data will be presented. The aircraft measurements will be coupled with extensive routine ARM SGP measurements as well as Large Eddy Simulation (LES), cloud resolving, and cloud-system resolving models. Ultimately, these integrated analyses and modeling studies will shed light on the effects of inhomogeneity in land use, vegetation, soil moisture, convective eddies, and aerosol properties (size distribution, composition, mixing state) on the evolution of shallow clouds. This includes the feedbacks of cloud radiative effects on the surface heat, moisture, and momentum fluxes and on aerosol photochemical processes via changes in the downwelling radiation.

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NCAR Foothills Laboratory
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Live webcast: http://ucarconnect.ucar.edu/live

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