BNL-77719-2007-AB

AEROSOL-CLOUD INTERACTIONS AT POINT REYES, CALIFORNIA

A. McComiskey, CIRES / NOAA
G. Feingold, NOAA/Earth System Research Laboratory
S. Frisch, NOAA/Environmental Technology Laboratory
Q. Min, State University of New York at Albany
D. Turner, University of Wisconsin-Madison
M. Miller, Brookhaven National Laboratory

For Presentation at the
Seventeenth Atmospheric Radiation Measurement (ARM)
Science Team Meeting
Monterey, CA
March 26-30, 2007

Environmental Sciences Department/Atmospheric Sciences Division
Brookhaven National Laboratory
P.O. Box 5000
Upton, NY 11973-5000
www.bnl.gov

ABSTRACT

We present results of analysis of aerosol-cloud interactions from the ARM Mobile Facility (AMF) deployment at Point Reyes on the northern coast of California. The Pt. Reyes site provided ample opportunity to observe marine stratus, a cloud type that has long been recognized as radiatively important, and which lends itself to investigation of aerosol-cloud interactions because its relative spatial homogeneity facilitates more accurate microphysical retrievals. Approximately seven months of ground-based in situ and remote sensing data relating to cloud and aerosol microphysical and optical properties are analyzed. Our thrust is to use this large data set to obtain robust relationships between aerosol, cloud microphysics and cloud optical properties. We have examined cloud conditions for each day of the AMF deployment at Pt. Reyes and found that unbroken, nonprecipitating marine stratus are common throughout the sunlit portion of many days during the observation period. Eighty-five days were chosen as suitable for analysis based on a liquid water path (LWP) threshold to ensure sufficient cloud thickness, minimal precipitation, and high quality aerosol observations. We have compiled a master data set of these days at common 20 second resolution from which our analyses are made. This facilitates analysis of the relationship between cloud and aerosol properties, specifically updrafts, aerosol cloud condensation nuclei (CCN), or its various proxies, and the cloud effective radius (r_e), LWP and optical depth (COD). Data is sorted by updrafts, LWP, and aerosol characteristics. Multivariate statistics indicate the most robust measures of CCN proxies and their correlations to different r_e and drop number concentration retrievals, indicating how aerosol effects on clouds may best be evaluated and quantified from ground-based remote sensing.