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DOE/SC-ARM-16-034

Stratocumulus Precipitation and Entrainment Experiment (SPEE) Field Campaign Report

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June 2016

ARM
CLIMATE RESEARCH FACILITY

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Stratocumulus Precipitation and Entrainment Experiment (SPEE) Field Campaign Report

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Work supported by the U.S. Department of Energy,
Office of Science, Office of Biological and Environmental Research

Acronyms and Abbreviations

ARM	Atmospheric Radiation Measurement Climate Research Facility
ASR	Atmospheric System Research
CFCR	Centroid Frequency Chirp Rate
CIRPAS	Center for Interdisciplinary Remotely-Piloted Aircraft Studies
DOE	U.S. Department of Energy
FMCW	Frequency Modulated Continuous Wave
GHz	gigahertz
LWP	liquid water path
MWR3C	Microwave Radiometer, 3-Channel
SGP	Southern Great Plains, an ARM megasite

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1.0 Summary

The scientific focus of this project was to examine precipitation and entrainment processes in marine stratocumulus clouds. The entrainment studies focused on characterizing cloud turbulence at cloud top using Doppler cloud radar observations. The precipitation studies focused on characterizing the precipitation and the macroscopic properties (cloud thickness, and liquid water path) of the clouds.

This project will contribute to the U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility's overall objective of providing the remote-sensing observations needed to improve the representation of key cloud processes in climate models. It will be of direct relevance to the components of ARM dealing with entrainment and precipitation processes in stratiform clouds. Further, the radar observing techniques that will be used in this study were developed using ARM Southern Great Plains (SGP) facility observations under Atmospheric System Research (ASR) support.

The observing systems operating automatously from a site located just north of the Center for Interdisciplinary Remotely-Piloted Aircraft Studies (CIRPAS) aircraft hangar in Marina, California during the period of 1 May to 4 November 2015 included:

1. Microwave radiometer: ARM Microwave Radiometer, 3-Channel (MWR3C) with channels centered at 23.834, 30, and 89 GHz; supported by Dr. Maria Cadeddu.
2. Cloud Radar: CIRPAS 95 GHz Frequency Modulated Continuous Wave (FMCW) Cloud Radar (Centroid Frequency Chirp Rate [CFCR]); operations overseen by Drs. Ghate and Albrecht.
3. Ceilometer: Vaisala CK-14; operations overseen by Drs. Ghate and Albrecht.

2.0 Results

The observing strategy was to make continuous measurements with the microwave radiometer to provide liquid water path (LWP) observations that will be combined with the cloud properties from the CIRPAS FMCW Cloud Radar (CFCR) and the ceilometer. These observations will be used to provide macroscopic cloud properties that will be combined with the detailed turbulence structure of the clouds from the Doppler cloud radar. The goal was to examine key processes involved in cloud-top entrainment and precipitation in coastal marine stratocumulus clouds. The results will be published in major atmospheric science journals. Raw data collected during the six months of operations are being processed to provide the macroscopic cloud properties needed to complete this study.

3.0 Publications and References

No published results to date.

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