Precipitation Measurements in Oklahoma Using In-Situ and Remote Sensing Instrumentation

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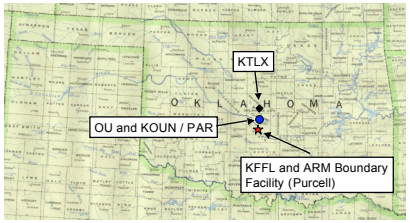
Introduction

Understanding the microphysics of precipitation and the atmosphere in which it forms and evolves is important to accurately estimate rainfall rates and improve parameterizations in models that predict the weather. Therefore, the University of Oklahoma (OU) in collaboration with NOAA's National Severe Storms Laboratory (NSSL) is building up a suite of instrumentation to measure the properties of precipitation at the Kessler Farm Field Laboratory (KFFL) in Central Oklahoma. KFFL is collocated with the ARM Southern Great Plains Boundary Facility in Purcell.



Weather Radars

Three S-Band weather radars are used in the study

- NSSL Polarimetric Radar (KOUN)
- NSSL/OU Phased Array Radar (PAR)
- NOAA WSR-88D (KTLX)

Kessler Farm Field Laboratory

KFFL is operated and maintained OU and offers excellent infrastructure opportunities. Furthermore, the close proximity of KFFL to Norman, OK (location of three weather radars) makes it an ideal location for joint precipitation studies.

Instrumentation / Resources at KFFL

- NOAA Profiler Network Radar
- OU Boundary Layer Radar
- OU PicoNet (Rain Gauge Network)
- OU 2-D Video Disdrometer
- Oklahoma Mesonet Station (Washington)
- ARM Boundary Facility (Purcell)

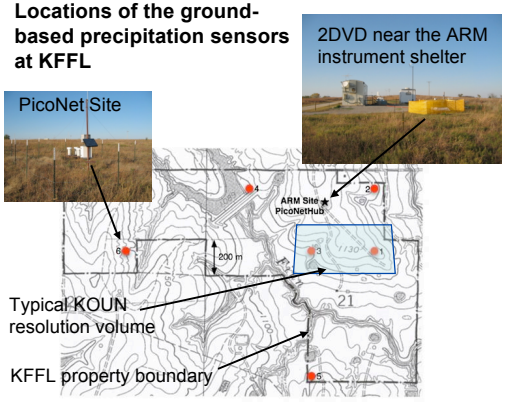
PicoNet

A dense network of rain gauges is located at KFFL for studies of spatial variability of precipitation. The minimum spacing within the network is 350 m, less than the resolution volume of KOUN when overlooking KFFL

2-D Video Disdrometer

The 2-D Video Disdrometer (2DVD) is capable of measuring the size, shape, orientation, and fall speed of precipitation particles. It is used to produce drop size distributions (DSDs).

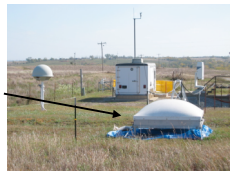
Locations of the ground-based precipitation sensors at KFFL



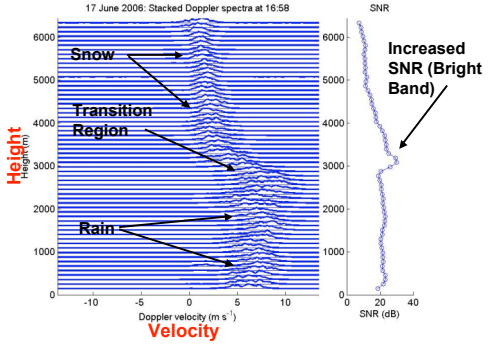
Profiling Radars

Vertically pointing profiling radars can be used to estimate the microphysical properties of precipitation aloft. The particle fall speeds are directly obtained through the calculation of the Doppler spectrum, which can in turn be mapped into a DSD.

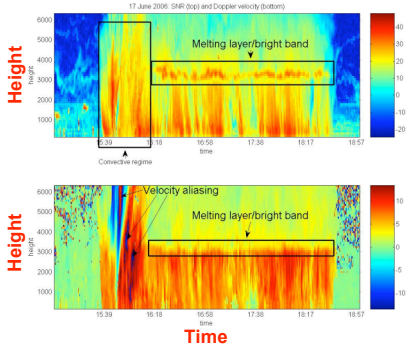
OU UHF Boundary Layer Radar (BLR) with the ARM trailer in the background



Stacked Doppler Spectra



The transition across the melting layer of precipitation particles is readily seen in the normalized stacked spectra plot from the Boundary Layer Radar (BLR). When taken as a composite plot (as shown below) the structure of the precipitation is revealed.



Summary

Joint remote sensing and in-situ precipitation measurements are being conducted at KFFL in Central Oklahoma. These complementary data sources offer tremendous potential for studies of precipitation microphysics and storm dynamics.

The deployment of the BLR and 2DVD are being hosted by the ARM Program.