

Precipitating cloud break-out session report

ARM CPWG meeting, 11-13 November, 2008

Presentations (4):

New data

1. Kollias and Lindauer

Gridded WSR-88D data around ARM SGP domain and comparisons with ECMWF model output.

2. Matrosov

On the use of WSR-88D radar measurements over the SGP site.

New retrieval techniques

3. Giangrande, Luke and Kollias

Retrievals of precipitation parameters using non-Rayleigh scattering at 95-GHz.

Perspective IOPs

4. Jensen, Kollias, Del Genio

A proposal for the GPM-ARM precipitation IOP.

Presentation summaries

Kollias

Gridded WSR-88D data around ARM SGP domain and comparisons with ECMWF model output.

suggested as PI VAP:

- gridded (2 x 2km) NEXRAD reflectivity maps in a 400 x400 km domain centered at SGP (15 min update). Data available from 1996.

this product also provides a simple classification of the radar echo (convective precipitation, stratiform precipitation, no-precip)

- occurrence of precipitation from NEXRAD observations correlates with model values for vertical velocities (better in spring/fall periods)
- reconstruction of S-band reflectivities over ARM wind profiles is possible

Presentation summaries

Matrosov

On the use of WSR-88D radar measurements over the SGP site.

- Issues to account for when using NEXRAD data in combination with ARM radar data:
 - attenuation of ARM radar signals in liquid phase
 - non - Rayleigh scattering at mm-wavelengths (reflectivity differences in non-attenuated reflectivities from NEXRAD and ARM radars could reach 10-20 dB; an approximation accounting for these differences is proposed)
 - vastly differing resolutions of NEXRAD and ARM radar data (need to average ARM radar data in space and time for the combined use with KVNK data; super-res NEXRAD data just became available: $\sim 0.25 \text{ km}^3$ instead of 1 km^3 over SGP)
- Independent validation of KVNK NEXRAD reflectivity data confirms their absolute calibration within $\pm 2 \text{ dB}$.
- Intercomparisons of non-attenuated reflectivities from ARM and KVNK NEXRAD suggest negligible offset between MMCR (general mode) and NEXRAD absolute calibrations.

Presentation summaries

Giangrande, Luke and Kollias

Retrievals of precipitation parameters using non-Rayleigh scattering at 95-GHz.

- A novel remote sensing technique retrieves a slope of the rain drop DSD (for larger drops, if the exponential drop shape is assumed)
- Retrievals are based on locations of first two non-Rayleigh Doppler spectra maxima as measured by the WACR (hence it is not effected by signal attenuation in rain)
- High spatial and temporal resolutions of the approach allow observations of the evolutions of the DSD slope in a vertical column
- Mean vertical air motions in rainfall can be estimated by locating the first minimum in the Doppler spectra

Presentation summaries

Jensen

A proposal for the GPM-ARM precipitation IOP.

- Main goals: to collect the data that will be used to improve convective parameterizations in models;
to evaluate GPM GV core instrumentation
- Time frame for IOP: May – June 2011 at/around the SGP site
- Collaborations: NASA PMM (GPM) Program, others
- Additional instruments: a dual-wavelength K_a - K_u band radar, C-Pol (S-Pol, X-Pol, CASA radars), profilers, a dense network of disdrometers and rain gauges....
- Additional measurements: e.g., radar refractivity measurements to map RH fields
- Time frame for proposal: A pre-proposal will be submitted in Feb 2009

Precipitating cloud PI VAPS

NEXRAD –based VAPS

Merged MMCR-NEXRAD reflectivity profiles over SGP
NEXRAD gridded reflectivity (coming soon)

Surface JWD precipitation VAPS

- JWD based time series of rain rate, V_D and reflectivities at S, C, K_a and W frequency bands (addition of median raindrop size)

Non-ARM instruments providing precipitation information

CASA X-band ($\lambda \sim 3$ cm) polarimetric radars

(convective dynamics, QPE, hydrometeor identification)

BOMRC C-POL ($\lambda \sim 5$ cm) polarimetric radar

(convective dynamics, QPE, hydrometeor identification
RHIs over the ARM site, vertical pointing mode)

Proposed new ARM instruments:

JWDs for mobile facilities

New important (for modelers) issues
which are being addressed by the
precipitating cloud sub-group of CPWG

Simultaneous retrievals of parameters of clouds
and rainfall in a same precipitating system

Retrievals of vertical air motions in precipitations

For stratiform precipitation so far