Synergetic Retrievals: A-band and spectral radiation closure:

Qilong Min
ASRC, State University of New York at Albany

Measurement capability
- Active Sensors: Scanning radars/lidar ➔ Vertical (horizontal) distributions
- SW radiometer, MWR & AERI: (Shortwave, longwave, Microwave)
- Spectral radiation: RSS, Shortwave Array Spectroradiometer (SASHE), HABS
Information content and instrument specifications

Instrument characteristics:

- Resolution
- Signal to noise ratio
- Out of band rejection
- Stability
- Nonlinearity
- Calibration

RSS === 2 pieces of independent information
SASHE === 2 ~ 4 pieces of independent information
HABS === 5 pieces of independent information
Oxygen A-band measurements and applications:

- Synergetic retrievals of cloud optical properties from Radar
- Better constraints on cloud drop size distribution

\[
LWP(\text{model}) \propto D^3 \quad R(\text{Radar}) \propto D^6
\]

\[
T(\text{A-band}) \propto D^2
\]

\[
R_e = a \times \exp[0.0384d\text{dBZ}] \\
LWC = b \times \left(10^{\frac{d\text{dBZ}}{10}}\right)^2.
\]
Oxygen A-band measurements and applications:

- High resolution oxygen A-band spectrometer (HABS)

**Graphs and Images:****

- **Normalized Radiance**
  - **Diffuse Radiance**
  - **Direct Beam Radiance**

**Images:**

- **DISCOVERY-AQ**
- **Jul 13 2011**
The retrieval algorithm of cloud optical depth and effective radius from MFRSR diffuse radiation has been implemented as ARM VAP---MFRSRCLDOD1MIN.VAP

- Entire package, including cloud fraction and optical depth of thin clouds, can be implemented as or updated into ARM VAP

- MFRSR measurements, combined with other passive and active measurements at six fixed ARM sites: SGP, Darwin, Manus, Nauru, Barrow, and Atqasuk

- Also at AMF field campaigns (PT-Reyer, Azores, Steamboat Springs)