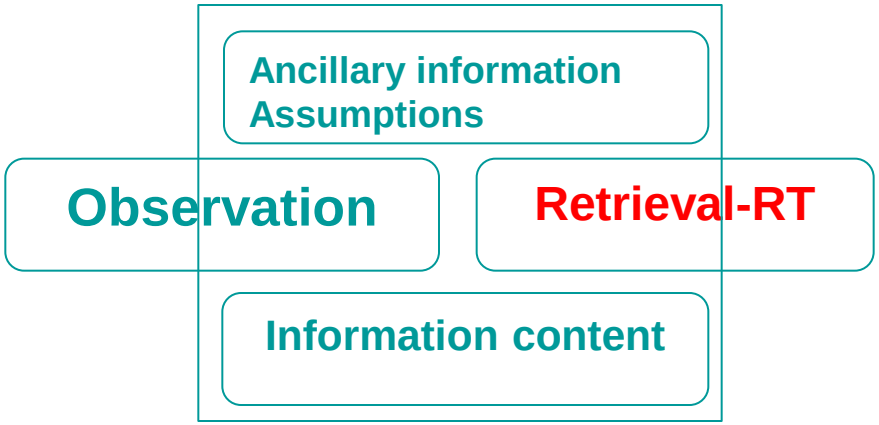
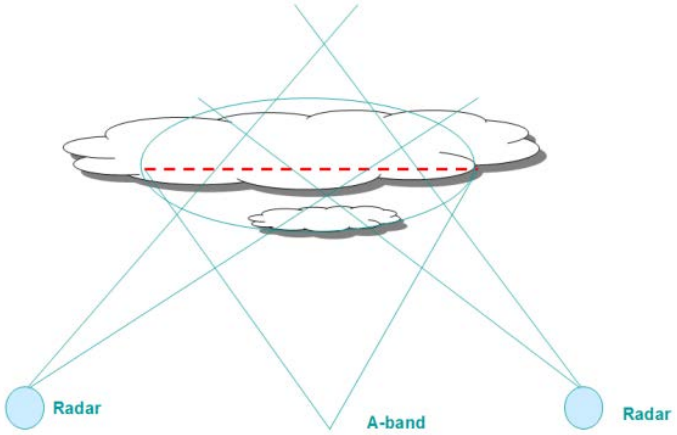
Synergetic Retrievals: A-band and spectral radiation closure:

Qilong Min
ASRC, State University of New York at Albany





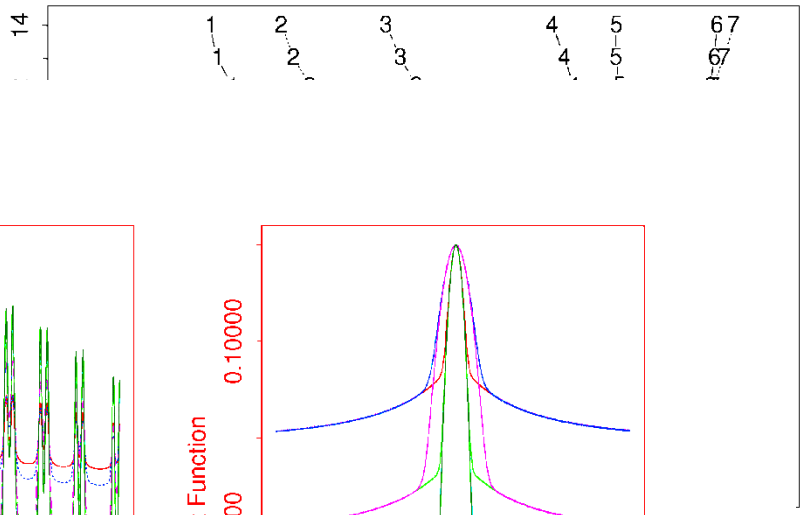
Measurement capability

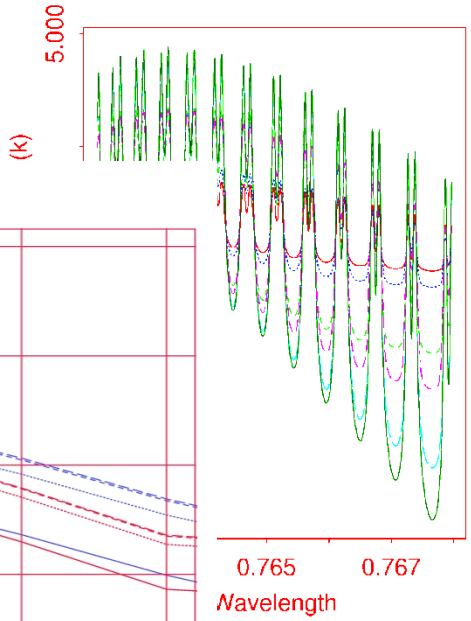
- **Active Sensors: Scanning radars/lidar ➔ Vertical (horizontal) distributions**
- **SW radiometer, MWR & AERI: (Shortwave, longwave, Microwave)**
- **Spectral radiation: RSS, Shortwave Array Spectroradiometer (SASHE), HABS**

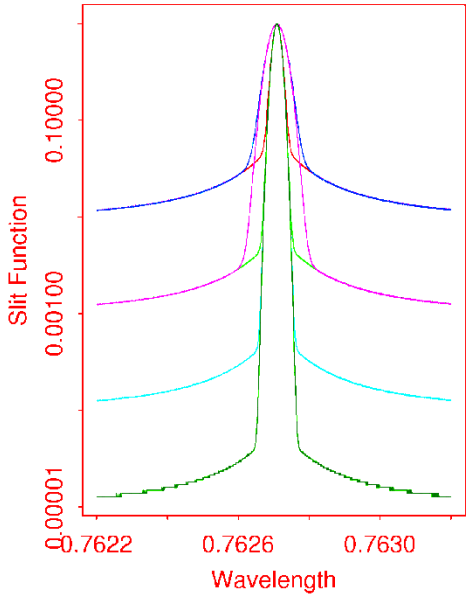
Information content and instrument specifications

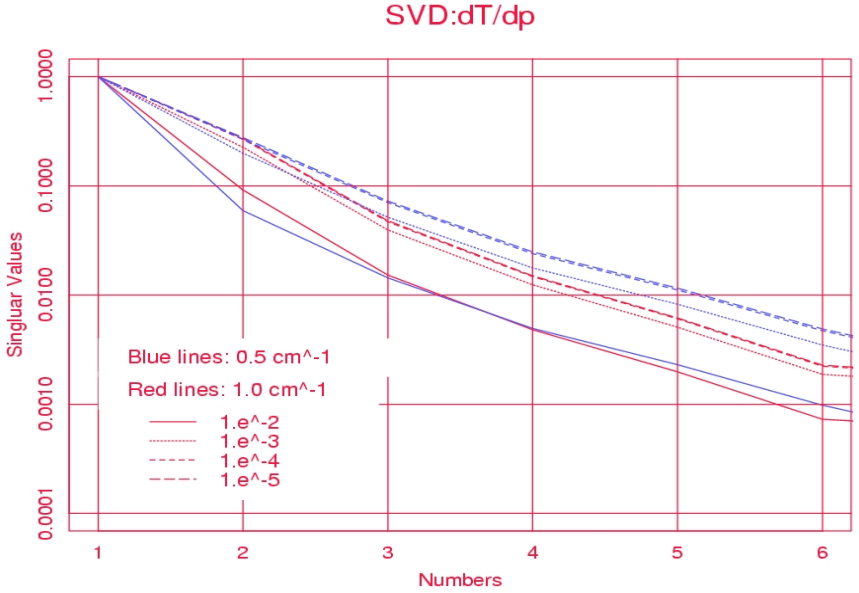
Instrument characteristics:

- 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

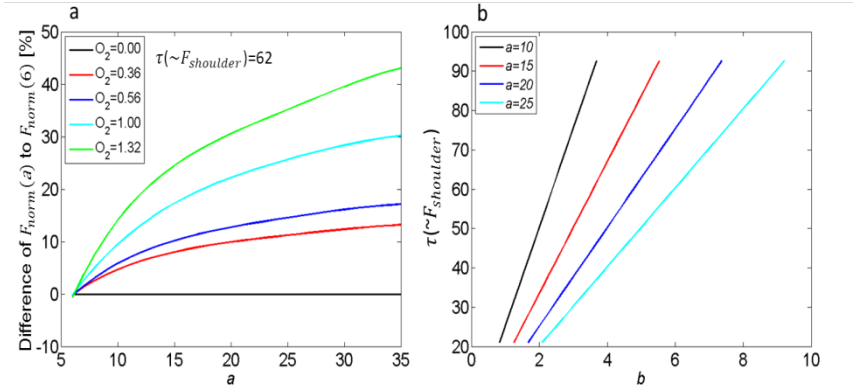
Oxygen A-band measurements and applications:

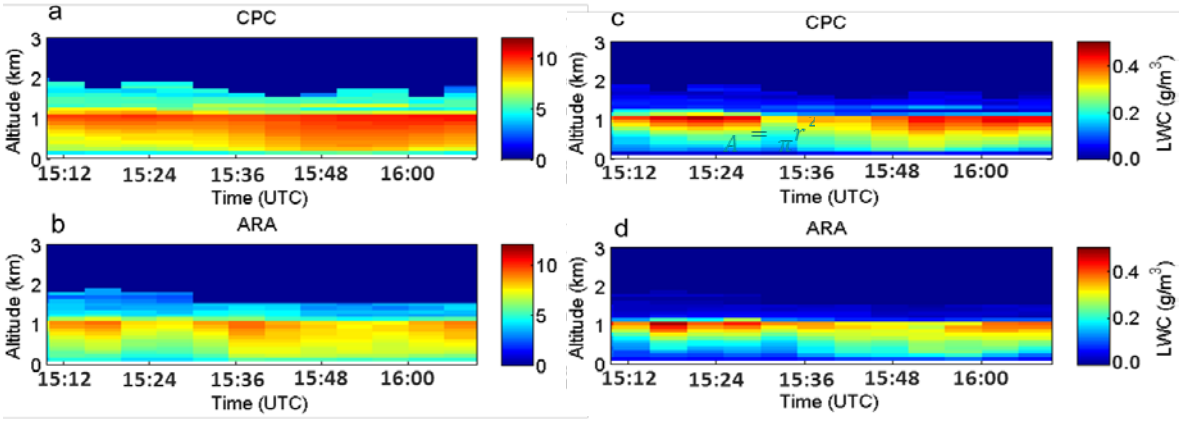
- **Synergetic retrievals of cloud optical properties from Radar**
- better constraints on cloud drop size distribution

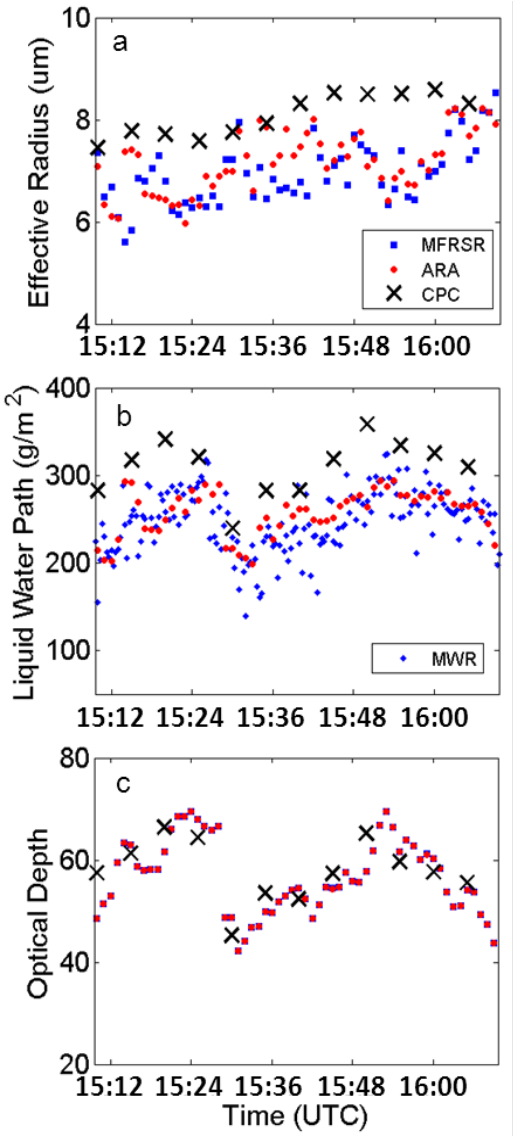
$$LWP(\text{model}) \propto D^3 \Leftarrow \begin{matrix} R(\text{Radar}) \propto D^6 \\ T(\text{A-band}) \propto D^2 \end{matrix}$$

$$R_e = a * exp[0.0384dBZ]$$

$$LWC = b * \left(10^{\frac{dBZ}{10}}\right)^{\frac{1}{2}}.$$



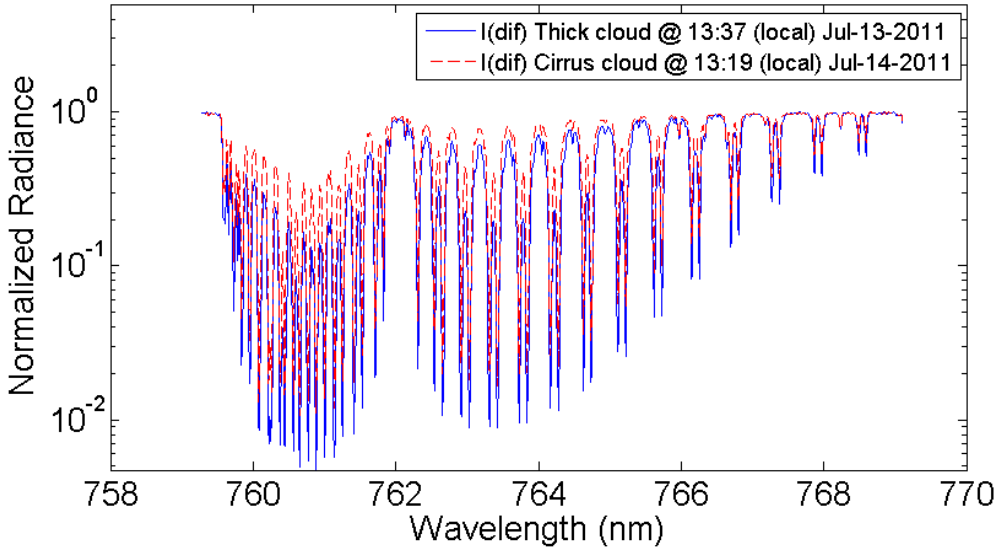


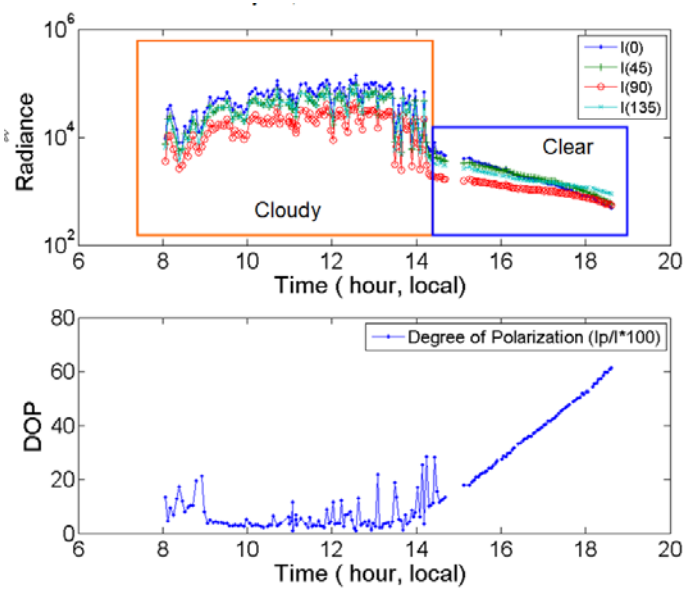


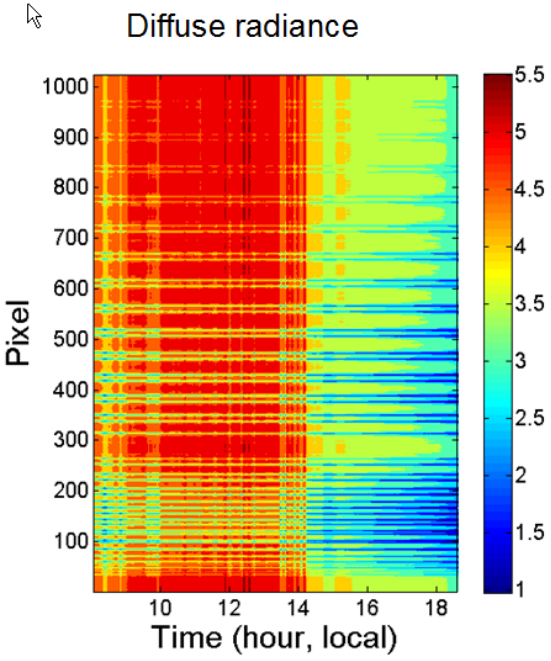
Comparison of Radar (CPC, Mace) and Spectrometer-Radar (ASR)

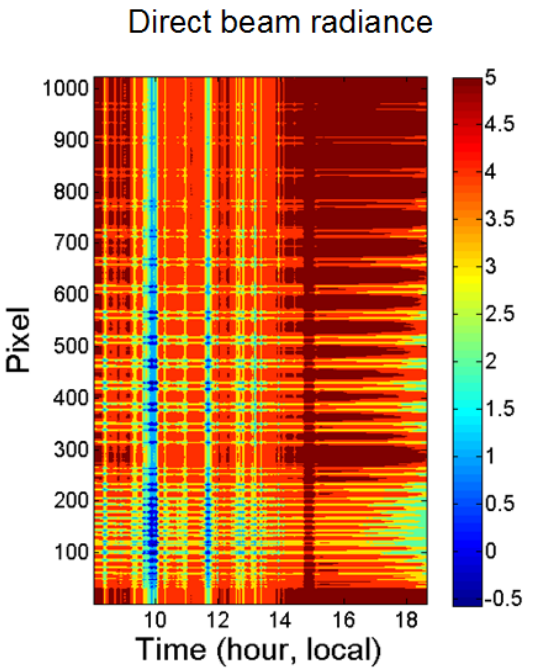
Oxygen A-band measurements and applications:

- High resolution oxygen A-band spectrometer (HABS)









MFRSR cloud/aerosol retrievals and applications

- 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)