Microwave Radiometer Observations During MC3E

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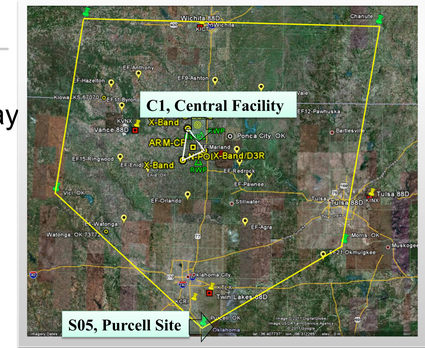
Abstract:

Ground-based two-channel microwave radiometers (MWRs) data have been used for over 20 years to retrieve perceptible water vapor (PWV) and liquid water path (LWP)- two important parameters for convective parameterization in large-scale models and cloud-resolving model simulations. During the Midlatitude Continental Convective Clouds Experiment (MC3E), in addition to the ARM 2-channel MWR deployed at the Southern Great Plains (SGP) central facility, BNL operated a five-channel (22.2, 23.0, 23.8, 26.2, 30.0GHz) MWR at the S05-Purcell, OK site [34.985 Lat., -97.522 Lon.]. Here we present PWV and LWP retrievals using the new MWRRET multi-wavelength retrieval algorithm for the BNL MWR. Time series of PWV/LWP are presented in the context of large-scale meteorology observed during the MC3E campaign and compared to radiosonde and Central Facility MWR observations.

1. Continental Convective Clouds Experiment (MC3E):

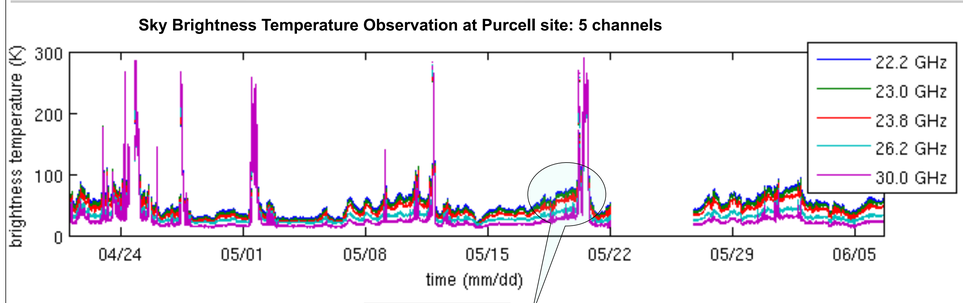
- Between April 21 and June 6, 2011
- Centered at the ARM Southern Great Plains site in Lamont, OK, with an extensive sounding array
- ARM and NASA ground-based, and aircraft observations, including the new ARM radar instrumentation
- Collaboration between DOE ARM and NASA Global Precipitation Measurement Mission
- Overarching goal to document and monitor precipitation, clouds, winds, and moisture in 3D, in order to advance the understanding of the different components of convective parameterizations

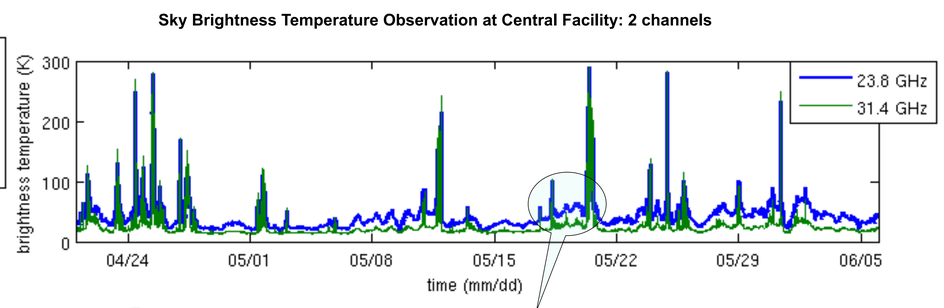


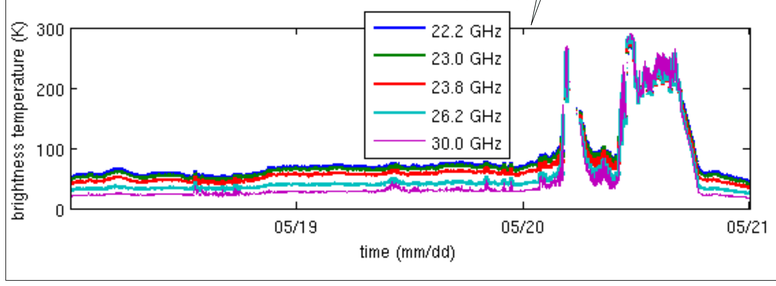
5 Sounding Sites
- S01
- S02
- S03
- S04
- **S05** *[34.985 degN Lat., -97.552 degE Lon., 334 m MSL]*

Central Facility with MWR
- **C1** *[36.606 degN Lat., -97.485 degE Lon., 316 m MSL]*

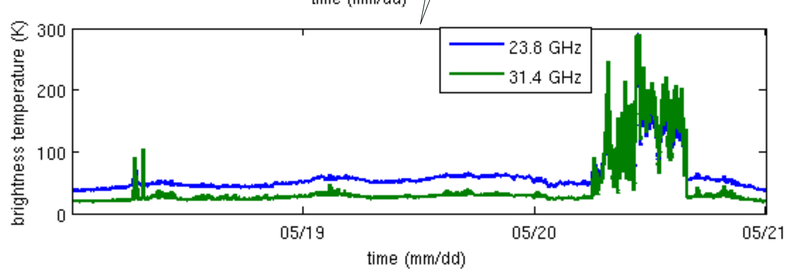
2. MWR Observations:



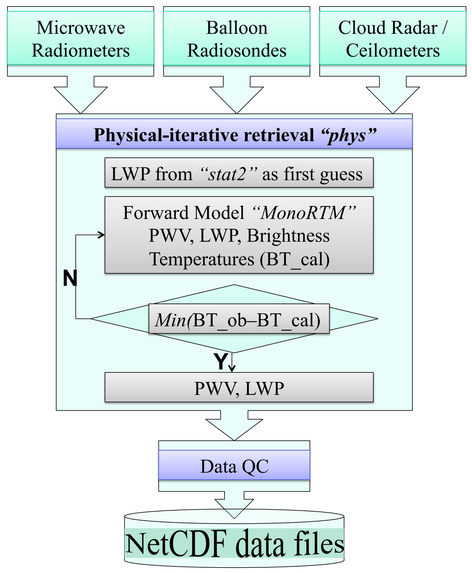




S05	C1
April 21 to June 6	April 21 to June 6
S05	**C1**
May 18 to May 20	May 18 to May 20

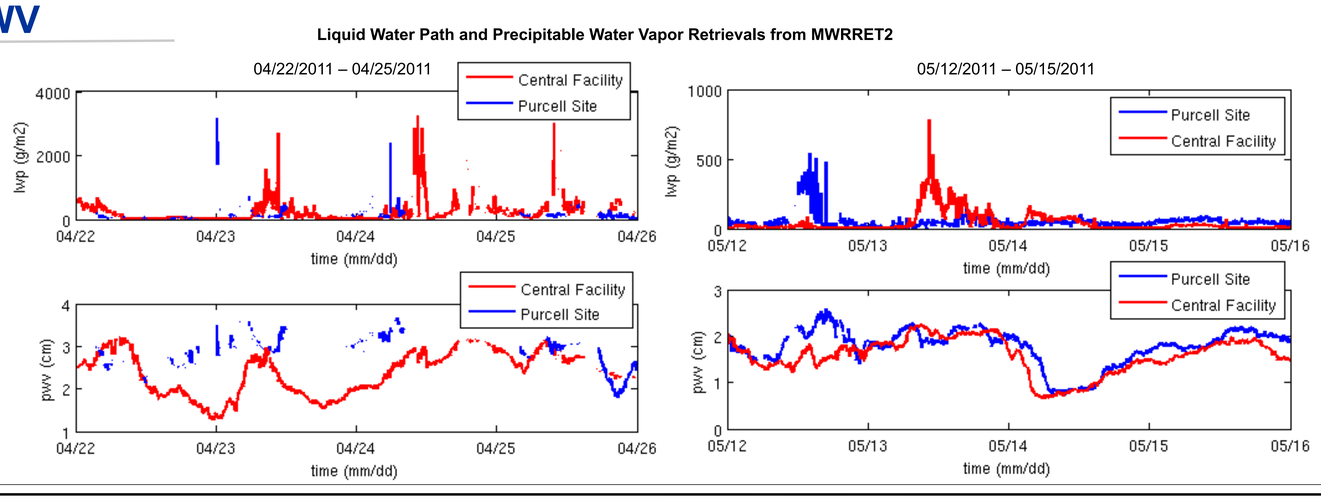


3. MWRRET2:

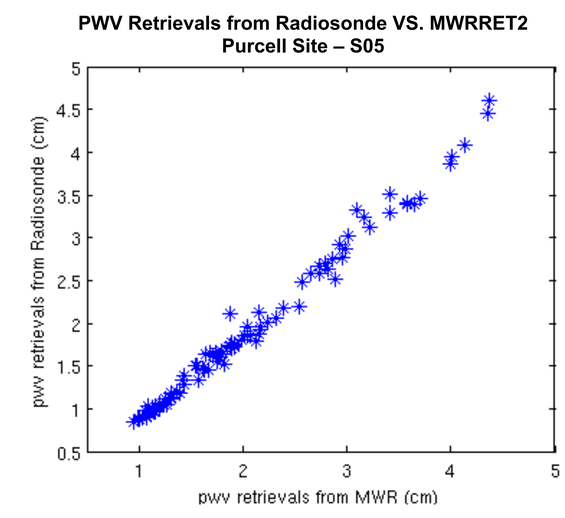


4. Time Series of LWP and PWV

- Liquid Water Path (lwp) and Precipitable Water Vapor (pwv) retrievals from Purcell Site (SGP 05) and SGP Central Facility (SGP C1) on 4 consecutive sample days are shown on the right.
  - period 1: 04/22/2011 – 04/25/2011
  - period 2: 05/12/2011 – 05/25/2011
- Data points are marked "INVALID" in the data files when qc tests fail.
- Sky brightness temperature measurements obtained from microwave radiometer are affected by raining condition, which claims the reason for most qc failures.



5. PWV Comparisons:



6. References:

David D. Turner, Shepard A. Clough, James C. Liljegren, Eugene E. Clothiaux, Karen E. Cady-Pereira, and Krista L. Gaustad, **Retrieving Liquid Water Path and Perceptible Water Vapor From the Atmospheric Radiation Measurement (ARM) Microwave Radiometers**, *IEEE Transactions on Geoscience and Remote Sensing, Vol. 45, No. 11, Novmber 2007.*