

*Pending Proposed Field Campaign*  
**Cloud Microwave Validation Experiment in  
Support of CLOWD**

*Steering Committee*

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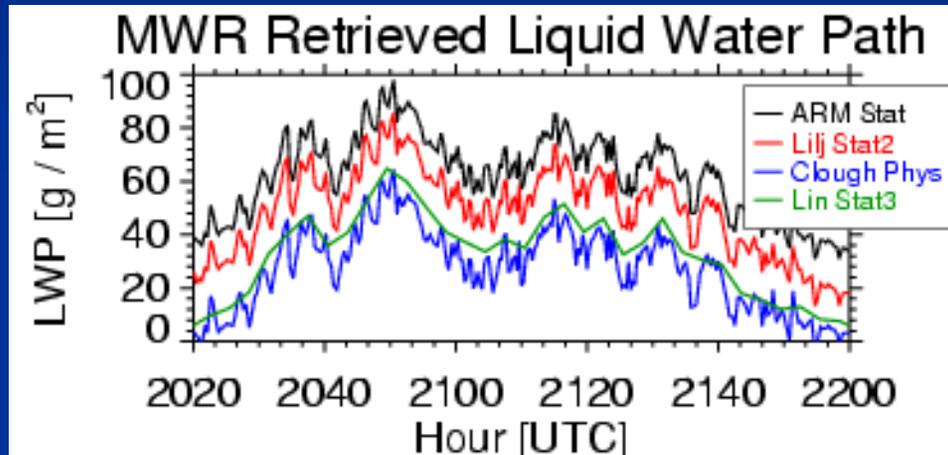
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# 1. Background

MWRs a promising way to get cloud LWP 24/7  
But, large diffs exist among MWR methods



Turner et al., *BAMS*  
Accepted

## 2-Channel MWR uncertainties of 25-30 g m<sup>-2</sup>

- Microwave absorption models
  - Spectroscopy
  - Cloud-water dielectric constants
- Retrieval inversion approach

## 2. What's Being Done?

### ARM purchasing 90 GHz MWRs

90/150 GHz from RPG

Expect to reduce uncertainty by at least half  
e.g., 25-30 g m<sup>-2</sup> to  $\leq 15$  g m<sup>-2</sup>

### However, there are 90 GHz issues to be addressed

- Instrument calibration
- Gas absorption model
- Liquid-water dielectric constants
- Retrieval approach

# 3. Opportunity: COPS

## Convective and Orographically-induced Precipitation Study

International Field Program

June - August 2007

Black Forest region

### Objective:

Improve QPF via improved 4-D regional observations of the pre-convective environment, cloud formation, and the onset and development of precipitation

### Approach:

Combine remote sensing, ground-based & airborne obs

Multi-wavelength remote sensing of atmospheric state

- Precip radars, Cloud radars, Lidars, MWRs, FTIRs

### **3. Opportunity, cont.**

**They submitted a successful proposal for the AMF**

Deployment for 9 months, April-December

European instrumentation co-sited with AMF

**90 GHz MWR (9 months)**

Susanne Crewell, University of Cologne

Same type as ARM, but w/ linear polarization

**HATPRO profiler (9 months)**

Susanne Crewell, University of Cologne

14 channels, full scanning (azimuth & elevation)

Similar to ARM 12 channel

**Water vapor DIAL (IOP and ?)**

Volker Wulfmeyer, University of Hohenheim

Absolute water vapor reference (2 to 3%); Scanning

**Raman lidar temperature profiles (IOP and ?)**

Andreas Behrendt, University of Hohenheim

Temperature profiles compl. water vapor DIAL; Scanning

# 4. Proposed Studies

*Getting at MWR spectroscopic & dielectric uncertainties*

## **Deploy 90 GHz w/ AMF at COPS (9 months)**

- 1) Conduct calibration intercomparisons
- 2) MWR Synergy exercises (2x90 GHz, 2-, 12-, 4-chan)
  - Benefits/trade offs of the different channels
  - Evaluate MWR models used in the field
- 3) Intercompare w/ Visible and IR Cloud retrievals
  - Fast-scanning AERI (Turner)
  - 2-NFOV (Chiu, Marshak)
  - MFRSR diffuse (Min)
  - W-Band cloud radar (Microbase)

# 5. Benefits

**Address MWR spectroscopic & dielectric uncert.**

## **1) Intercompare calibrations**

- Our 90 GHz
- 12-Channel calibration w/ HATPRO

## **2) Excellent complementary MWR radiometric database w/ complementary measurements**

- Sonde launches (9 months)
- Absolute water vapor reference from DIAL
- Raman temperature profiles

## **3) Intercomparisons**

- Visible/IR/Radar retrievals

# Benefits (cont.)

## 4) Accurate LWP provides means to:

- a) Test & develop accurate parameterizations of the RT on this end of the LWP spectrum
- b) Clouds with low LWP are perhaps the most sensitive to perturbations by aerosol
  - Accurate LWP are needed to isolate the effect of aerosols on the clouds vs other effects (1st indirect effect, and perhaps 2nd)

