

# **Microwave Spectroscopy Validation Experiment**

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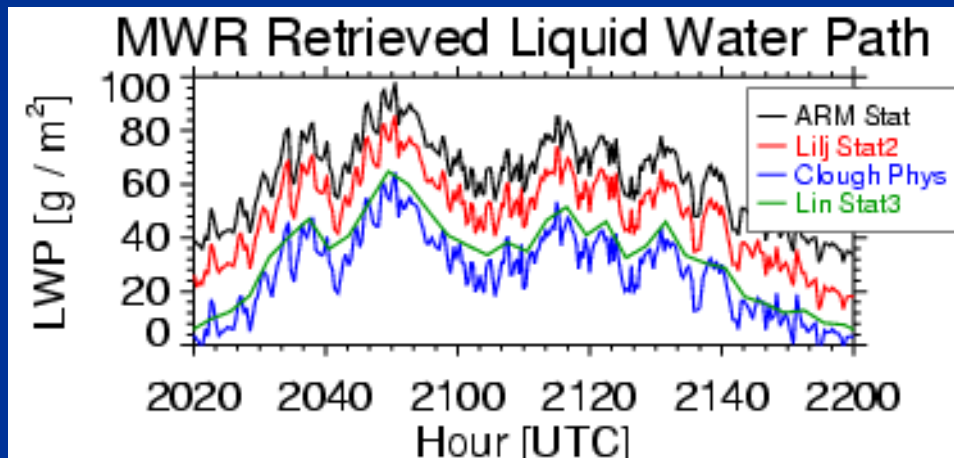
**Jim Liljegren, ANL**

**An IOP proposal to the  
IRF & CP Working Groups  
ARM Science Team Meeting 2006**

# 2. Background – The Issue

## CLOUD BAMS Paper submitted

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



Turner et al. (2006)

## Mailbox-MWR uncertainties of 25-30 $\text{g m}^{-2}$

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

# 3. What's Being Done?

**Many ARM researchers working on the MWR issues**  
e.g., AER, ANL, ETL, University of Wisconsin-Madison

**ARM purchasing 90 GHz MWRs**

89 & 150 GHz from RPG

Delivery: April (1<sup>st</sup> MWR), Fall (2<sup>nd</sup> MWR)

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

**How can we help things along?**

# 4. Opportunity: COPS

## Convective and Orographically-induced Precipitation Study

International Field Program

June - August 2007

Black Forest region

### Objective:

Improve precipitation forecasts by forecast models

Lacked quality data sets needed for initial fields

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

## 4. Opportunity, cont.

*(i.e., yes, but why is this an ‘opportunity?’)*

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

Deployment for 9 months, starting about April  
European instrumentation co-sited with AMF

### ❖ **Susanne Crewell, Universitaet Muenche**

Interested in Dave Turner’s AERI work

Bringing 90 GHz MWR (9 months)

Same type as ARM, but w/ linear polarization

Bringing HATPRO profiler (9 months)

14 channels, full scanning (azimuth & elevation)

Similar to ARM 12 channel

### ❖ **Volker Wulfmeyer, Universität Hohenheim**

Bringing water vapor DIAL (IOP and ?)

Absolute water vapor reference

Scanning

# 5. Proposal

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

- 1) Conduct calibration exercises
- 2) MWR Synergy exercises
  - Both 90 GHz
  - Plus the 2-, 12-, and 14-channel MWRs

## Benefits

- 1) Our 90 GHz calibration
- 2) 12-Channel calibration w/ HATPRO
- 3) Excellent complementary MWR radiometric database
- 4) Complementary measurements
  - Sonde launches (9 months)
  - Absolute water vapor reference from DIAL

**Plus... 'Build it and it and they will come'**

# 6. Budget

## Items Envisioned

Shipping and deployment of 90 GHz

Some support for Maria and Jim extra time

- Coordination help
- Analysis

**That would get the job done!**

**However...**

**If approved...**

**We might want to consider...**



# 7. Additional Thoughts

... **Benefit from items previously recommended by IRF and/or CP WG**

- items cannot be put in IOP budget

**Revisit priority list?**

❖ **AMF AERI being fast scanning**

**Also helpful, but less imperative...**

- **2-NFOV instrument w/ AMF (Sasha)**
- **MFRSR diffraction lobe scanner (Min)**

**That's it!**

**Approval?**

**Additional ideas/comments?**