

ARM Cloud Modeling Working Group Translator Update

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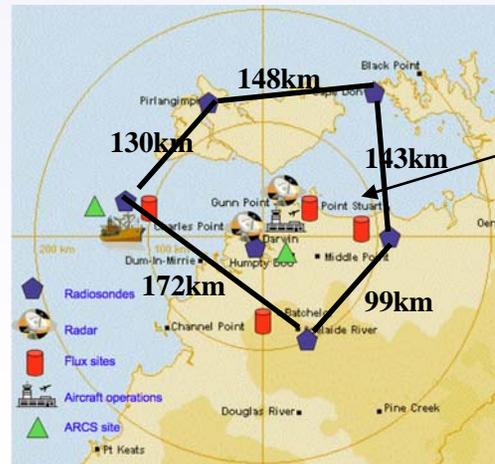
17th Annual ARM Science Team Meeting, Monterey, CA, 26-30 March, 2007

Outline

- 1. Status on TWP-ICE Analysis***
- 2. Proposal to develop new forcing datasets***
- 3. Availability of cloud microphysical properties compatible with forcing data (Mace)***
- 4. Critical VAPs to CMWG***

Status on TWP-ICE Analysis

- We have successfully performed the variational analysis for TWP-ICE
 - A beta version of the data is being tested by several modeling groups
- An official release of the data will be within two weeks after the ARM meeting



Analysis Domain

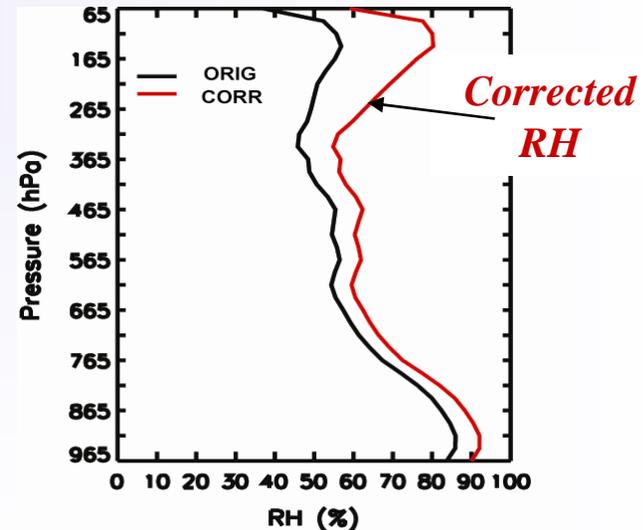
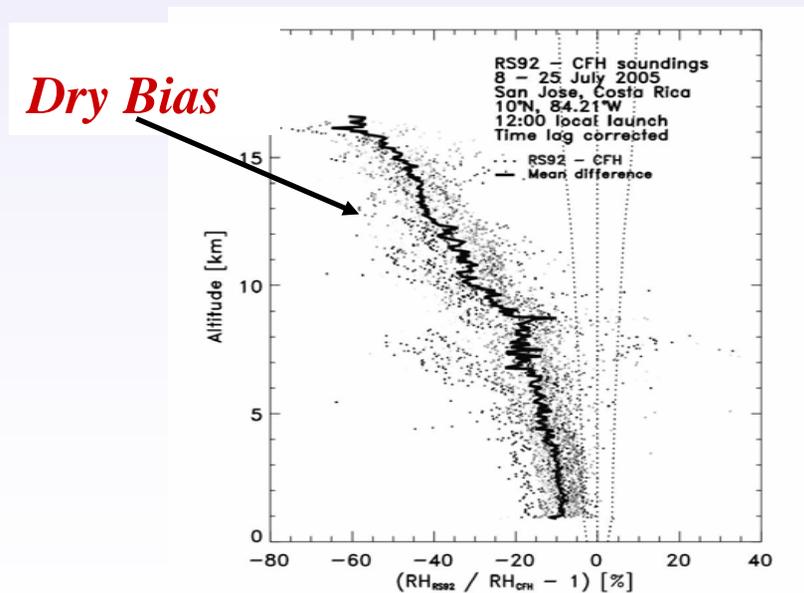
Acknowledgments

- This is a joint effort between LLNL (Xie, McCoy, Klein), BMRC (Hume, Jakob), and SUNYSB (Zhang)
- Jim Mather, Peter May, Chuck Long, Nigel Tapper, Pat Minnis, and many many others who collected, processed, and made the data available for us to use

Some Details About the Analysis

(See Xie et al. poster for more details)

- The analyzed forcing and evaluation data are available from Jan.19 – Feb. 12, 2006 (25 days). The ECMWF analyses are used for the period (1/19-1/21) when we do not have sounding data.
- A quick correction for the dry bias in the original sounding data has been made using the algorithm described in Vomel et al. (2007) with improvements made by Hume (2007) (See Hume's poster for details).



Comparison of humidity from RS92 and Cryogenic Frostpoint Hygrometer (From H. Vomel et al., 2007)

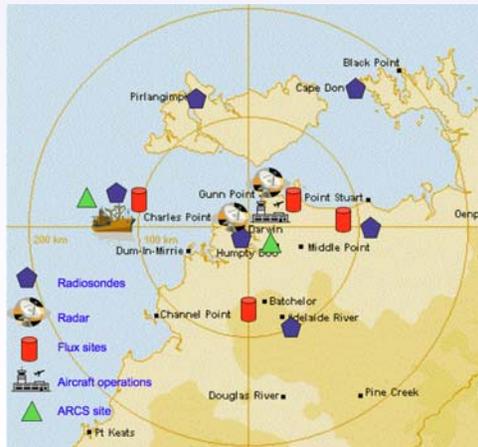
Some Details About the Analysis

(See Xie et al. poster for more details)

- Surface and TOA constraints used in the variational analysis are obtained from available observations during the IOP.
 - Surface precipitation from BOM precipitation radar
 - Surface radiation and turbulent fluxes from the ship and limited land stations
 - Surface meteorological data from soundings and local mesonet stations
 - TOA fluxes from satellite (MTSTAT)

Issues

- Only a limited number of stations available;
- both ocean and land area contained
- Large missing gap in some surface flux measurements

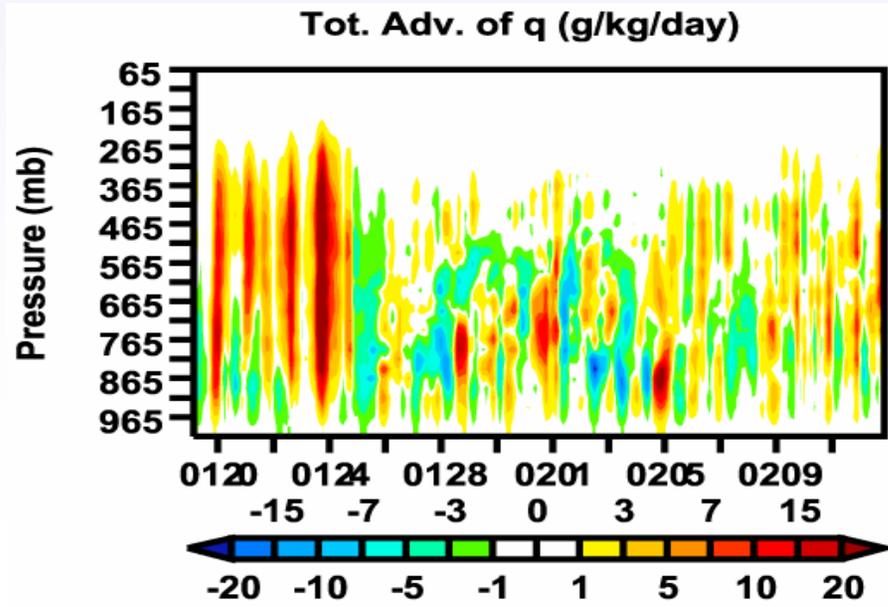
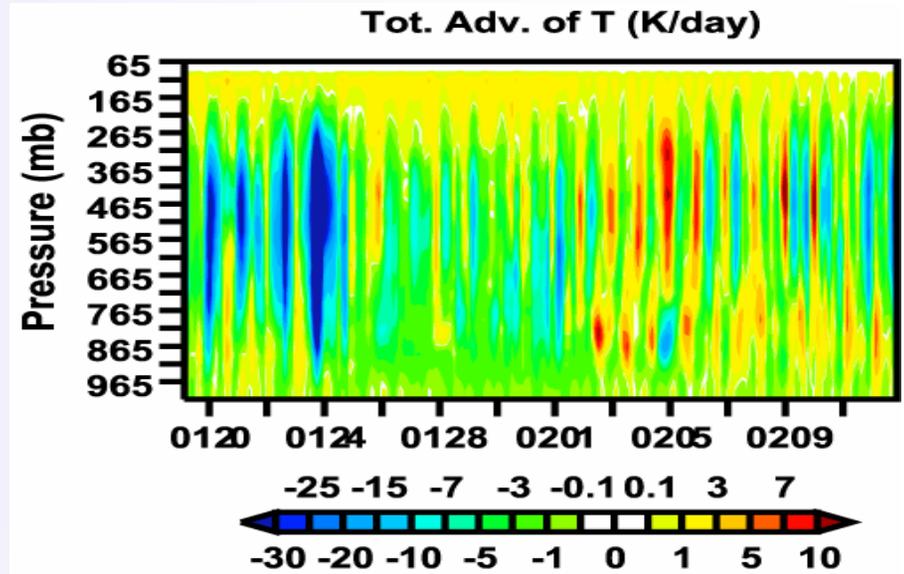
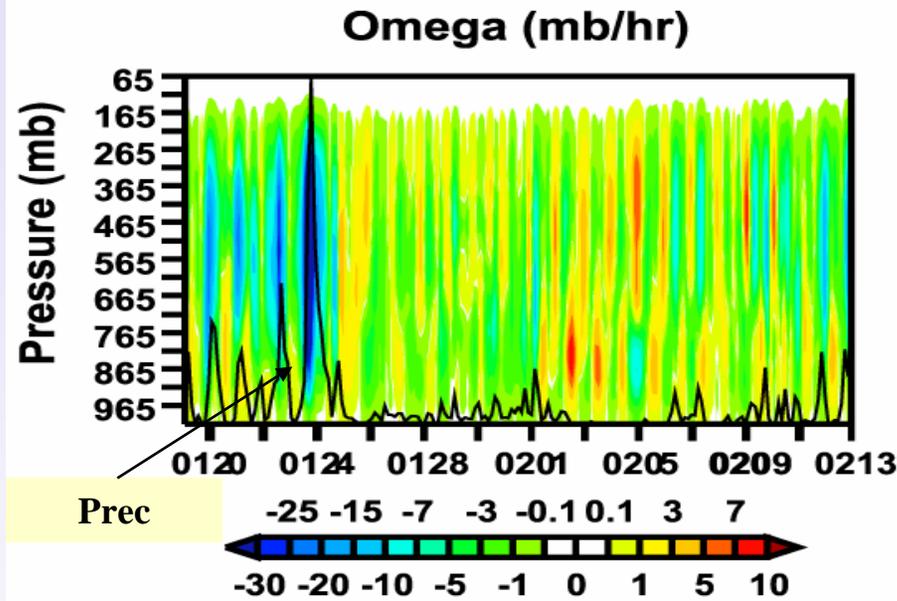


What we did in the analysis

- Domain mean is a weighted average based on the surface type represented by each flux site
- ECMWF data are used to fill in gaps in the measurements

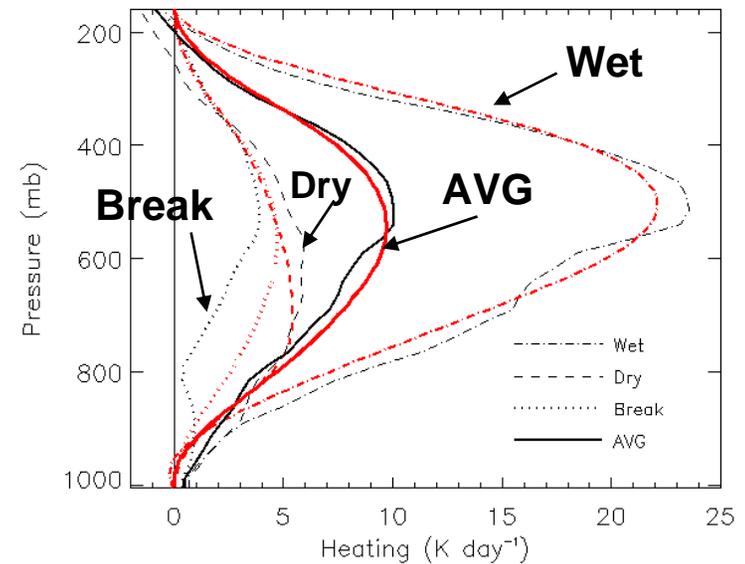
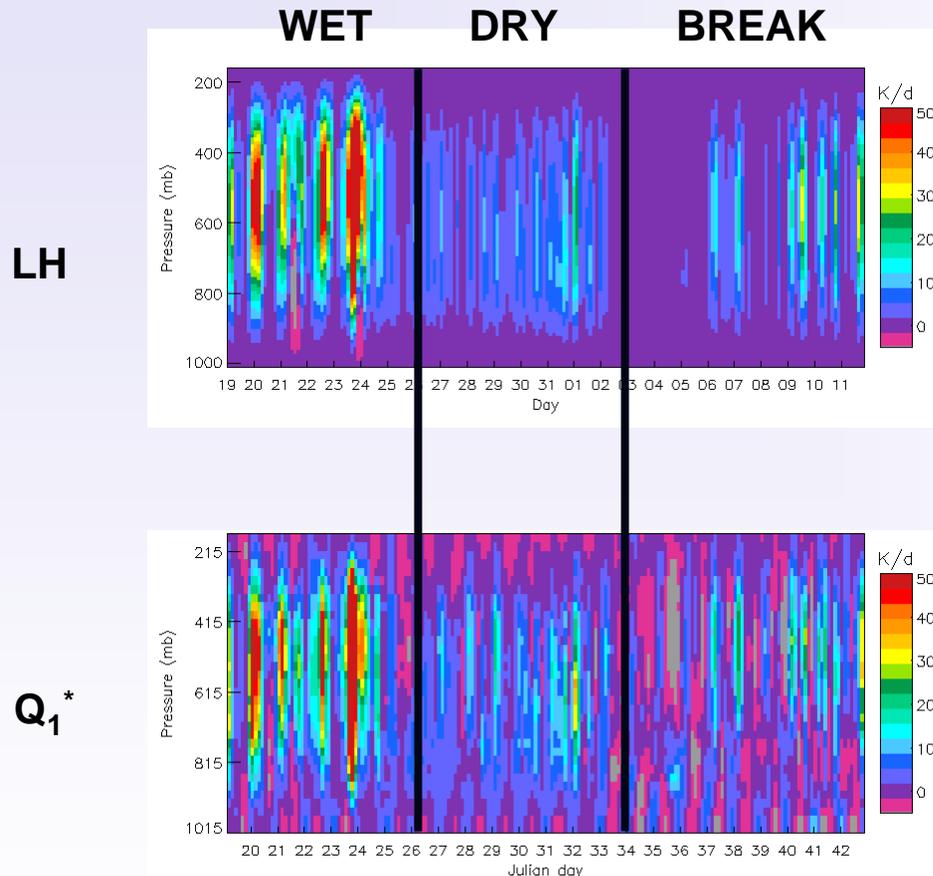
Large uncertainty should be expected in the mean fluxes

Derived Large-scale Forcing Fields



The analyzed fields show strong upward motion, advective cooling, and moisture convergence Corresponding to the observed precipitation,

TWP-ICE C-POL derived LH and variational analysis Q_1^* (19 Jan - 11 Feb 2006)



RED: LH; Black: Q1

Q1 = radiative heating + LH + vertical transport of heat by eddies

LH: latent heating derived from C-POL radar precipitation, its vertical distribution based on a weighting of the idealized stratiform, deep convective, and shallow convective heating profiles described in Schumacher (2004)

* = sensitivity run

Courtney and Shaocheng, TWP-ICE Breakout

Future Work

1. *Further improvement on RH*
2. *Examine Errors in the surface precipitation (use Rain gauge data)*
3. *How do the derived forcing fields respond to those uncertainties in constraints?*
4. *How do SCMs/CRMs respond to the uncertainty in the forcing fields?*
5. *An ensemble forcing dataset will be developed from Jakob's group*

Questions?

Proposal to Develop New Forcing Datasets

1. **CLASIC IOP** – cloud & land surface interaction campaign

June 9 – 30, 2007, two 5-day sounding IOPs, 8 times/day

2. **Extend the long-term continuous forcing data at SGP to recent years**

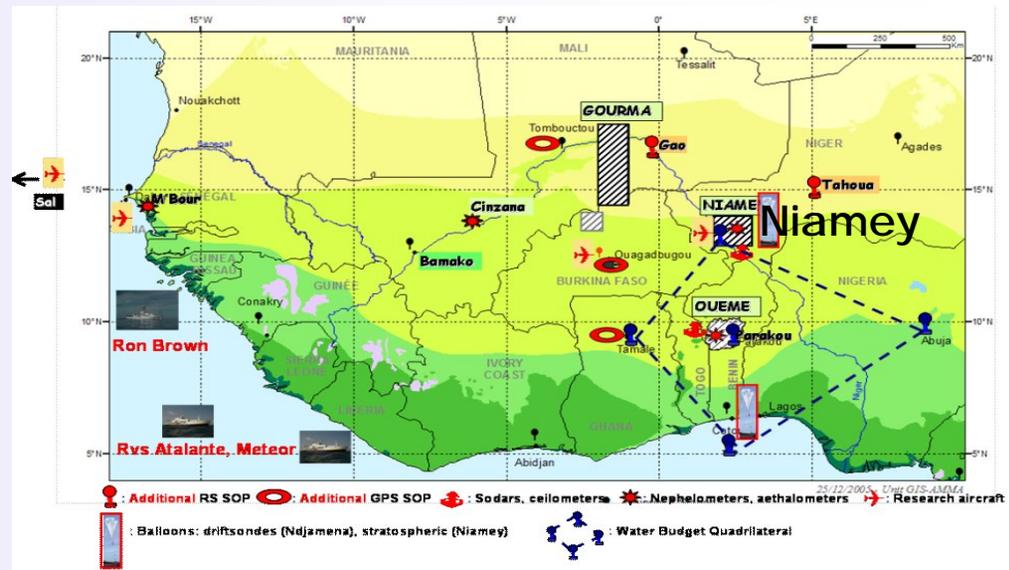
- 1999-2001 developed
- requests received
- Updated instruments and data in recent years
- Various observations are integrated
- Statistical studies

3. **Analysis for AMMA**

AMMA

(African Monsoon

Multidisciplinary Analyses)



- An international project on the West African Monsoon and its variability
- A Multi-Year Campaign over West Africa and the Tropic Atlantic
- The DOE ARM had its mobile facility in Niamey for the entire year 2006
- There were 2 sounding IOPs with 8 radiosondes per day for the periods 20-30 June 2006 and 1-15 August 2006. One before the onset of the monsoon and the second during the full monsoon season.

Questions?

- *Should we perform the variational analysis for these two IOPs or longer period*
- *Is it a time for us to collaborate with modeling groups in Europe for some selected cases in AMMA?*

Questions?

Are you satisfied with the forcing data we provided?

Availability of cloud microphysical properties compatible with forcing data

The following two data teams have been regridded onto the same temporal and pressure levels used in the variational analysis forcing data to facilitate the use of these data by modelers

- 1. Microbase products from BNL (Available 3/00 – 2/01 at SGP; 1/04 – 12/04 at NSA, 11/03 – 10/04 at Manus)**
 - 2. Mace's 8-year cloud property data at SGP**
- The regridded data are currently available for the period of 03/2000 – 02/2001 for MICROBASE and entire 2000 for Mace's data**
 - Plan to do this for the periods when both cloud property data and forcing data are all available**

Jay's presentation

Critical VAPs to CMWG

VAPs = Value Added Products, total 47 VAPs developed

***Critical: the quantities are critical for model developments and evaluations**

A preliminary list

1. *Variational Analysis VAP*
2. *ARSCL (Active Remote Sensing of Cloud Layers)*
 - *Cloud hydrometeor height, radar reflectivities, vertical velocities and Doppler spectral widths.*
3. *BBHRP (Broadband Heating Rate Profile)*
4. *MICROBASE (Continuous Baseline Microphysical Retrieval)*
 - *Liquid/ice water content, cloud particle effective radius, and cloud fraction*
5. *BAEBBR (Bulk Aerodynamics Energy Balance Bowen Ratio)*
 - *SH and LH*
6. *MWRRET (Microwave Radiometer Retrievals)*
 - *LWP and PW*

Other Relevant VAPs to CMWG

- **BEFLUX (Best-Estimate Surface Radiation Flux) (SW at CF SGP)**
- **LS SONDE (Liebe Scaled Sonde)**
 - RH is scaled to match the MWR PW
- **MFRSR CLDOD (Cloud Optical Properties)**
- **SFC CLD GRID (SGP Area Surface Cloud and SW Radiation Grid)**
 - 0.25x0.25 degree lon/lat grid over SGP domain, SW
- **SW DIFF CORR (SW diffuse correction)**
 - Correction of diffuse SW measurements for IR loss
- **SW FLUX ANAL (SW Flux Analysis)**
 - Apply a clear-sky detection and fitting technique to data
- **Merged Sounding**
 - A combination of observations from radiosonde soundings, MWR, surface meteorological instruments, and ECMWF model output

Questions?