

## **Summary and action items from the Fall 2005 Meeting**

*Steve Klein and Minghua Zhang*

The fall meeting of the ARM CPM working group took place on October 12-13, 2005 at the State University of New York at Stony Brook and was kindly hosted by Professor Minghua Zhang. Despite horrible weather, the meeting was well attended with over 30 scientific presentations and over 60 attendees.

The meeting commenced with a discussion of the priorities for ARM by Dr. Warren Wiscombe (NASA/GFSC), the new ARM chief scientist. These priorities included a more active engagement of ARM scientists and data with the 3 primary U. S. climate modeling groups (GFDL, GISS, and NCAR) as well as an improvement in the packaging of ARM data to make it more accessible to the broad scientific community. On the instrument side, he noted an increased emphasis on connecting the remote sensing of clouds with that of precipitation. Dr. Wanda Ferrell then gave a brief overview of the ARM funding condition at the meeting.

Following these introductions, the meeting was sub-divided into 4 main sessions: (a) the Mixed-Phase Arctic Cloud Experiment, (b) deep and shallow convection, (c) frontal and low cloud systems, and (d) general observations.

The Mixed-Phase Arctic Cloud Experiment (M-PACE) was an ARM field experiment which took place over the North Slope of Alaska in October 2004. At the meeting, presentations were given on the relationship between the clouds and the synoptic forcing (Jerry Harrington, PSU, invited) as well as an overview of the scientific issues involved in modeling Arctic mixed phase clouds (Hugh Morrison, NCAR, invited). Subsequent presentations involved preliminary modeling results from Large-eddy simulations (Ann Fridland GISS), nested regional models (Alex Avramov PSU), single column models (Surabi Menon LBNL), and global climate models run in weather prediction mode (Shaocheng Xie LLNL). One theme of the modeling involves the difficulty of maintaining mixed phase clouds in the presence of ice nuclei. Shaocheng Xie presented details of the Variational Analysis he has performed with the sounding network in place for M-PACE and which is now available to run single column and cloud resolving models. On the second day of the meeting two presentations discussed observations of the microphysics of the clouds retrieved from the ARM remote sensors (Jay Mace U. Utah) and measured in-situ by aircraft (Greg McFarquhar U. Illinois). Steve Klein (LLNL) discussed the plans for an intercomparison utilizing these observations of models driven by the variational analysis. Details of the intercomparison are available from a

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website (<http://science.arm.gov/workinggroup/cpm/scm/scmic5/index.html>). This intercomparison will contrast the microphysics from the multi-layer stratus present on October 6-7 with the single layer stratocumulus on October 9-12. Simulations will be performed in time for discussion at the Spring 2006 ARM Science Team meeting. Contact Steve Klein ([klein21@llnl.gov](mailto:klein21@llnl.gov)) to indicate a desire to participate.

The convection session presented a number of interesting results. Results from the two multi-scale modeling frameworks (MMFs, aka “super-parameterizations”) that have been created were shown by Marat Khairoutdinov (CSU MMF) and Wei-Kuo Tao (NASA GSFC MMF). Other talks discussed the representation of aerosol-cloud interactions in cloud resolving models (CRMs, Steve Chin LLNL), the comparison of 2-dimensional and 3-dimensional CRM simulations (Xiping Zeng GSFC), and comparison of CRM results to satellite observations by ISCCP (Steve Krueger U. Utah) and the newer NASA EOS satellite products (Yali Luo NASA Langley). Parameterizations of moist convection were prominently featured particularly in regard to the diurnal cycle of convection over land (Dave Randall CSU), the transition from shallow to deep convection (Chris Bretherton UW), the momentum transport by organized convection (Anning Cheng NASA Langley). Shallow convection was featured in a talk about the closure for shallow convection schemes (Roel Neggers ECMWF) and ARM observations of the diurnal cycle of shallow cumulus at the SGP site (Larry Berg PNL). An emphasis on the performance of cumulus parameterizations in their host climate models as opposed to single column models was provided by Steve Klein (LLNL) and Jon Petch (UK Met. Office) both of whom discussed how the behavior of cumulus parameterization in a climate model differs markedly with the simulation in a single column model. In particular, Jon Petch discussed the current GCSS intercomparison case – a simulation of TOGA-COARE with climate models run in weather prediction mode.

On Thursday October 13, issues regarding the modeling of frontal and low clouds in climate models were discussed. These include the temperature of the liquid to ice transition in frontal clouds (Tony DelGenio NASA GISS), evaluations of microphysics in frontal (George Tselioudis NASA GISS) or orographic clouds (Brian Colle SUNY-Stony Brook) from regional models, and the distribution of clouds in frontal cloud systems of climate models (Wuyin Lin and J Wu SUNY-Stony Brook).

The meeting concluded with a session on the state of various observations of use to ARM modelers. Chuck Long (PNL) reviewed the state of his surface cloud grid product which gives the horizontal distribution of surface shortwave radiation, cloud effect and cloud cover for the ARM SGP site. Doug Spangenberg (NASA Langley) discussed the issues involved in detecting mixed phase clouds from satellite observations while Kirk Ayers (NASA Langley) discussed the state of the satellite products produced by Pat Minnis’s group in support of ARM. Pavlos Kollias (BNL) reviewed the upcoming changes to the

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retrieval of cloud locations from the cloud radars (i.e. the ARSCL product) that result from the change in the radar processing modes that are occurring at the ARM sites. James Liljegren (ANL) reviewed the status of measurements priorities requested by the ARM CPM and asked for input on upcoming purchase options in the next few months. (See his presentation at the CPM website and send e-mail to Steve Klein ([klein21@llnl.gov](mailto:klein21@llnl.gov)), Minghua Zhang ([mzhang@notes.cc.sunysb.edu](mailto:mzhang@notes.cc.sunysb.edu)) or Tony Delgenio ([adelgenio@giss.nasa.gov](mailto:adelgenio@giss.nasa.gov)), if you wish to make a recommendation). The meeting finished with a brief review of the upcoming major ARM field campaigns in Darwin Australia (TWP-ICE, January/February 2006) and at the SGP (CLASIC, June/July 2007, contact: [larry.berg@pnl.gov](mailto:larry.berg@pnl.gov)).

Action Items:

1. The MPACE intercomparison plan and schedule have been formulated (<http://science.arm.gov/workinggroup/cpm/scm/scmic5/index.html>). We encourage people to join this activity and we expect to have some results at the next ARM Science Team Meeting in March 2006. For the MPACE case study, in addition to CRM and SCM modelers, we also wish to see people from the LES and Mesoscale modeling community to participate.
2. The ARM CPM WG case studies have now covered clouds relevant to all three ARM sites: convective, frontal, and arctic clouds. We expect the WG members to follow through many issues raised in previous case studies and report results to the WG at the next Science Team and Working Group meetings.