

## 7<sup>th</sup> WMO-ICCP Cloud Modeling Workshop

The 7<sup>th</sup> World Meteorological Organization (WMO) Cloud Modeling Workshop is planned for July 14-16, 2008, in the vicinity of Cancun, Mexico, immediately after the International Conference on Clouds and Precipitation (ICCP). Past WMO cloud modeling workshops have taken place approximately every 4 years, extending back to 1985. Since these workshops have evolved from WMO's earlier weather modification activities, the emphasis has traditionally been on cloud microphysics and interactions between the microphysics and dynamics. As numerical weather prediction (NWP) models use higher spatial resolution and begin to approach convection-permitting scales (i.e., horizontal grid length on the order of a few km's or less), the development, testing, and improvement of microphysical parameterizations is arguably even more important than before, since the microphysics in such models directly drives the cloud-scale thermodynamics and dynamics. This is also true for high-resolution "cloud-resolving" global models and climate models utilizing the multi-scale framework.

Broadly, the goals of the workshop are to provide an assessment of the state of the art of cloud modeling, to identify key gaps in the ability of models to represent clouds, and to suggest potential pathways for model improvement. The strategy is similar to past WMO cloud modeling workshops that have utilized observationally-derived case studies to provide a framework for the model intercomparison. The focus is on three key areas: 1) deep convection, 2) stratiform mixed-phase clouds, and 3) cloud chemistry. While representation of cloud microphysics in models and interactions of the microphysics with other model components have received recent attention in other frameworks (e.g., GEWEX Cloud System Study; GCSS), these issues have had comparatively less focus in the three areas listed above.

We plan to solicit contributed papers that discuss specific aspects of the cases, in addition to other papers discussing various topics related to modeling cloud processes and cloud chemistry. Approximately thirty people from several different countries have so far expressed interest in attending the workshop; we expect more people to participate as the process moves forward.

A web site with more detailed information on the workshop should be available soon.

For additional information, please contact:

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Details of the proposed case studies are given below.

1. Cloud chemistry. Two cases have been identified from ICARTT measurements conducted from the Canadian Convair 580 while based out of Cleveland, OH, in July-August 2004. A number of trace gas, aerosol, and cloud parameters were measured.

These include aerosol particle chemistry with an AMS and a PILS, cloud droplet residuals with an AMS downstream of a CVI, and bulk cloudwater chemistry. Of particular interest may be how models simulate the processing of nitrogen and sulphur through cloud, how carbonyl compounds are scavenged by cloud, and the effects of cloud microphysics on chemistry. The two cases are as follows:

1) Chemical processing by boundary layer cumulus downwind of Chicago region. Clouds and air below cloud were sampled along the 86W meridian and then along the 84W meridian between about 40.5 and 42.6 N with westerly winds. A large plume impacting the clouds was encountered along both lines downwind of Chicago. This case may be suited for comparison of cloud chemistry in regional-scale models. Case leaders: Richard Leitch, Wanmin Gong, Anne Marie MacDonald.

2) Chemical processing by towering cumulus. Measurements were taken below cloud and at multiple levels within the cloud. This case may be suitable for cloud-scale and parcel models. Case leaders: Richard Leitch, Anne Marie MacDonald, Wanmin Gong.

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2. Mixed-phase stratiform clouds. Two cases have been identified:

1) Persistent mixed-phase arctic stratus observed during the SHEBA field experiment during May 1998. Single-layer, boundary layer mixed-phase cloud with cloud top temperature of  $\sim -20$  C, weak turbulent surface fluxes over a sea-ice-covered surface. Extensive cloud and thermodynamic measurements from aircraft and ground-based instruments. Primary focus is on the ability of models to maintain this long-lived mixed-phase cloud, despite the weak forcing and cold temperatures. Likely to be a joint case with GCSS Polar Cloud Working Group. Suitable for single-column, cloud-resolving, and LES models. Case leader: Hugh Morrison.

2) 2D orographic precipitation from a mixed-phase cloud system based on idealized and real cases. For the idealized case, the focus is on orographic precipitation resulting from stable upslope flow over a bell-shaped mountain (hydrostatic wave or blocked flow conditions). The real case is based on an event in the European Alps during March 2004. Initial thermodynamic and microphysical (CCN/aerosol spectra) data are taken from field campaign observations. Measurements of precipitation, radar reflectivity, and cloud microphysics (droplet concentration, liquid/ice water content) are available for evaluation of the models. The primary focus is on the partitioning of condensate between the liquid and the ice-phase and the amount and distribution of precipitation. Furthermore, estimates of the indirect aerosol effect on mixed-phase clouds and precipitation can be compared among the models. Case leaders: Andreas Muehlbauer and Ulrike Lohmann.

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3. Deep convection. Two cases have been identified:

1) Midlatitude squall line case(s) based on observations near Oklahoma City. Two candidate squall lines are being considered: 13 Jun 2002 (IHOP field study) and 12-13 May 2005. Both have polarimetric radar data and detailed Oklahoma mesonet observations in addition to the standard suite of wind profilers, radiosondes, etc. The latter case also provides video disdrometer data used to create observed rain drop size distributions during a passing mature squall line. Idealized 2D and fully 3D cases are likely to be developed from one or both of these events. Primary focus is on surface precipitation, cold pool characteristics and storm morphology (e.g., development of the trailing stratiform rain region). Case leaders: Greg Thompson and Ed Brandes.

2) Supercell-type deep convection with either cold ( $< 5\text{C}$ ) or warm ( $>15\text{C}$ ) cloud base. Cold-based case occurred near Greeley, Colorado during post cold-front upslope initiation scenario. Warm-based case occurred near Oklahoma City in a dry line initiation scenario. Available observations are from polarimetric radar, dual-doppler radar, WSR-88D, and rawinsonde. Hydrometeor characteristics based on fuzzy logic interpretation of polarimetric data following Straka et al. (2000; JAM). Primary focus is on rain development, recycling, and rear and forward flank cold pool strength, with a secondary focus on hail development. Case leader: Jerry Straka.

Principle organizers:

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