CCSM Atmosphere Model Working Group Report
1-3 March 2005
NCAR, Main Seminar Room

The Atmosphere Model Working Group (AMWG) began with a status report on the Community Atmosphere Model (CAM) and a summary of papers submitted to a special issue of *Journal of Climate* documenting the behavior of CCSM3. Brian Eaton reviewed software issues.

The loss of software resources due to budget stringencies has eliminated community support for diagnostics. The working group expressed alarm at this situation. The next stage of atmospheric model evolution is likely to require extensive, easily run diagnostics, so the situation must be remedied as soon as possible. The AMWG requested the development of a database to which all members of the group would have access. The database would include diagnostics, run procedures, and information on history tapes for runs deemed important by developers. As alternate physics packages are explored, this information will be essential in guiding experimental choices and evaluating model behavior.

Presentations by AMWG members covered high-resolution modeling and downscaling, Bony analysis, climate sensitivity, ENSO, data assimilation, chemistry, and parameterizations for convection, gravity waves, and radiation. These presentations will be made available on the Web.

The AMWG was in general agreement with a strategy for evolving a new-generation model in which promising combinations of new approaches to boundary-layer processes, shallow and deep convection, and large-scale clouds developed by the community would be culled, in consultation with the AMWG, to produce a candidate configuration. It was recognized that intensive efforts to integrate different physical packages would be required to produce a high-quality model and that this integration will need to be focused in a highly interactive group. This would require a sustained level of effort at NCAR's Climate Modeling Section. The group acknowledged the substantial reductions for CAM and the AMWG in scientific and software engineering support due to budget reductions, and expressed their support for augmented scientific and technical resources to improve the situation in as timely a way as possible.

There was agreement among the members that the time had come to transition to model development within the Finite Volume (FV) dynamical core framework.

Focus groups on convection, large-scale clouds, high-resolution models, and microphysics met. The large-scale cloud group noted that single-column studies with a PDF-based cloud parameterization are underway and endorsed continued efforts with this approach. Work on overlap in conjunction with this parameterization was encouraged. Short-term research on convection will explore a new closure based on free-troposphere equilibrium with the current Zhang-Hack approach. Studies with the Emanuel parameterization have shown some promise and will be continued, and further examination of the Donner parameterization is planned as well. It is hoped these can be tested in coupled mode after modest additional development. The microphysics group is actively engaged in a range of studies, with special emphasis on ice and aerosol issues. The important role of vertical velocity (including at sub-grid scales, especially for convection) is emerging and will pose new requirements on convective and large-scale cloud parameterizations, though less urgently in the latter case. The high-resolution focus group outlined their plans for a series of FV core simulations at approximately 0.5 and 1 degree resolution and an exploration of the use of those simulations to drive a regional climate model for the short term (< 1 year). In the longer term (2-5 years) they expressed interest in simulations with higher vertical resolution, the use of alternate physical parameterizations, and embedding rainshadows in the sub-grid scale orography scheme.

Two sessions were held jointly with the Ocean Model Working Group (OMWG). High-priority goals are significant reductions in biases associated with ENSO, the seasonal cycle, and MJO in coupled integrations. A variety of physical mechanisms that might explain the current large biases in the coupled system were discussed. Within the atmosphere these mechanisms include the formulations for convection, boundary layer clouds, and the planetary boundary layer formulation. On the ocean side, inadequacies in the current representations for tropical instability waves (TIW) and the representations of the diurnal cycle of the sea surface temperature were identified as areas for focus. The OMWG will explore sensitivity of the ocean model to TIW and provide to the AMWG indications as to characteristics of surface climate important for a realistic simulation of these phenomena. The AMWG will evaluate the performance of new physical parameterizations in accordance with these characteristics. The groups agreed that it was important to examine the transient aspects of model simulations (both coupled and uncoupled) at a much earlier stage in the development process than done previously. This will begin immediately. The groups agreed on the need for a "task team" to be identified to define a strategy for improving these aspects of the coupled model simulations.

Participants:

Jeff Anderson	Jim Hack	Rodney Schmidt
Fred Baer	Chuck Hakkarinen	Edwin Schneider
G. Bala	Mike Iacono	Karen Shell
Crispian Batstone	Steve Jayne	Rick Smith
Chris Bretherton	Don Johnson	Oyvind Soland
Philip Cameron-Smith	Akira Kasahara	Bill Spotz
Julie Caron	Jeff Kiehl	Ragoth Sundararajan
Curt Covey	Dongdul Kim	John Taylor
Aiguo Dai	David Lawrence	Joe Tribbia
Charlotte DeMott	Taotao Qian	John Truesdale
David DeWitt	Kevin Raeder	Houjun Wang
Leo Donner	Phil Rasch	Dave Williamson
Philip Duffy	Lucrezia Ricciardulli	Xiaoqing Wu
Brian Eaton	Mathew Rothstein	Guang Zhang
Steve Ghan	Saravanan	Mingyu Zhou
Andrew Gettelman	Fabrizio Sassi	Ping Zhu