

**Minutes of the Joint CCSM Advisory Board Meeting  
and  
CCSM Scientific Steering Committee  
22 June 2005  
The Village at Breckenridge, Breckenridge, CO**

CAB Attendees: Daniel Jacob (Chair), Michele Rienecker, John Drake, David Schimel, Eric Sundquist, David Griggs, Richard Rood, Rick Anthes, Tim Killeen, Annick Pouquet, Jay Fein, Kiran Alapaty, David Bader, Anjuli Bamzai

SSC Attendees: Bill Collins (Chair), Peter Gent, Chris Bretherton, James Carton, James Hack, William Large, James Hurrell, Cecilia Bitz, Danny McKenna, Scott Doney, Gordon Bonan, Ben Santer, Mariana Vertenstein, Lydia Shiver

1. **Introductory Remarks.** Daniel Jacob (Chair of the CAB) welcomed everyone and stated that he had been very impressed with the scope, depth, and breadth of CCSM. He thanked Bill Collins on behalf of the CAB for his service to CCSM as chair of the SSC for 2 years, and he welcomed Peter Gent, the new chair of the SSC starting 1 July 2005. He also welcomed Ricky Rood as a new member to the CAB.
2. **University Participation in CCSM Development.** Bill Collins thanked the CAB members for helping to guide the CCSM project over his 2-year term.

Collins gave an overview of the agencies, laboratories, and universities that participate in CCSM. He stated that DOE's participation and budget for CCSM is about \$9 million per year, which includes funding for Warren Washington's group, Los Alamos National Laboratory scientists, and 3-year university grants. DOE collaborators also developed the POP and CSIM components of CCSM, are collaborating on current biogeochemistry and chemistry research, and helped with software engineering and implementing the Earth System Grid (ESG) to transfer CCSM model code and data to the community faster.

NASA participation includes the Earth System Modeling Framework funding and development and collaboration of the finite volume dynamical core. NOAA's participation includes parameterizations used in the ocean component.

University collaborations include many joint, peer-reviewed papers and NCAR Technotes on CCSM development; parameterization development; small, focused research groups with PIs based at universities and labs (CPTs); participation in CCSM working groups and community workshops; and use of CCSM for research and teaching. Collins reported that there are 46 PhD and MS theses using NCAR models from 28 academic institutions. University collaborations from SIO, SUNY/SB, UW, UCI, U. Illinois, MIT, PU, SIO, UCSC, U. Wisconsin, and CSU have and continue to develop atmospheric parameterizations included in CAM; collaborations from UW, UCI, UCSC, U. Wisconsin, CSU, and CU have and continue to develop sea ice parameterizations included in CSIM;

collaborations from UCI, WHOI, UC Berkeley, and CU have and continue to develop parameterizations included in the biogeochemistry component; 13 university collaborations are ongoing in the land model component; and ocean collaborations are ongoing with MIT, UCLA, WHOI, LDEO, UC Berkeley, UCLA, U. Miami, and WHOI. In total there are 22 institutions currently involved in developing CCSM.

Twenty-three NCAR/CGD and ACD scientists are acting as integrators and collaborators in the development of the land, atmosphere, ocean, ice, biogeochemistry, and chemistry components of CCSM. CCSM has a wide variety of ongoing and active university collaborations with universities, DOE, and NASA scientists, and NCAR serves as a critical fulcrum for the scientific and technical development and integration of CCSM.

Jacob stated that he thinks ESMF will really help to ensure the code is written well. A CCSM postdoctoral program was suggested again, and it was noted that funds have not been found to support it. Killeen stated that NCAR has preserved and augmented its Visitor Program, augmented the ASP program and made the postdoctoral salaries more competitive, the new faculty fellowship program has been started, and recruitment of a total of four new scientists and engineers is in progress.

3. **Implications of Level Funding for the CCSM Program.** Jacob stated that the CAB asked Collins to report on what CCSM could do with the funding resources they currently have.

Collins reported that CCSM could accomplish further development with existing resources in chemistry and biogeochemistry, in the physical climate system, and in moving software engineering to a more unified and simplified framework. He also stated, if additional resources were available, CCSM could characterize and understand the interactions of chemistry, biogeochemistry, and climate in some detail; reduce biases in the physical climate; improve underlying engineering of the model to create a more flexible, extensible, and efficient code; test the model thoroughly on a wide variety of platforms for a wide range of experiments; and entrain and engage university collaborators and other participants with comprehensive community support.

Jacob stated that we need to think very hard about specific priorities. Collins said that we need an implementation plan that prioritizes the science CCSM wants to do and must do. Sundquist stated we need an implementation plan but we need to have a team focus on diagnostics, communications across working groups, and a strategy for prioritization. Doney asked what are the most important biases that need to be addressed. Jacob suggested a meeting of the working groups together. Drake stated that reducing the biases needs more strong emphasis, and Large stated that CCSM has prioritized and is concentrating on reducing biases. Collins stated that prioritization of the CCSM project is a must. Bader stated that SciDAC Phase II planning is under way now and hopefully that will help the software engineering shortage. Rood stated that a list of scientific questions and a task and validation plan would determine integrations done and the path to follow in the future. Bamzai stated that SciDAC and CCSM should discuss priorities because DOE is re-competing funding for SciDAC II late 2005 and a white paper is in progress.

4. **Scientific targets and resources needed for IPCC AR5.** Collins reported that the scientific targets are to develop, characterize, and understand the most realistic and comprehensive model of the observed climate system possible. The major challenges to meet our targets are to 1) develop representations of the physical climate that are more consistent with observations and current theoretical developments, 2) characterize and understand the mean climate and climate feedbacks including coupled chemistry and biogeochemistry, 3) engineer CCSM4 to be portable, flexible, and readily extensible, and 4) identify sufficient computing resources to run CCSM4 for IPCC and other applications. If we are given additional resources we could also 1) improve the fidelity of the physical climate and its interactions with chemistry and biogeochemistry, 2) improve our ability to evaluate many aspects of the model using the observed record, and 3) improve our ability to adapt the model to handle new process models and new applications.

The resources needed are 1) to strengthen our efforts to address long-standing biases in the physical climate, 2) enhance the software engineering effort required to build a coupled chemistry-climate model, and 3) add computational capabilities because the cost of CCSM4+chemistry+BGC is more than 25 times our current capabilities.

Our priority should be on the physical climate because 1) simulations will only be credible if our simulations of the observed record are as realistic as possible, 2) our simulations of chemistry and biogeochemistry will only be as good as the physical climate interacting with those processes, 3) our simulations with dynamic vegetation and with an interactive carbon cycle are already hampered by serious deficiencies in continental precipitation fields, air temperature, etc., and 4) many of the biases are most sensitive to our treatments of atmospheric physics and dynamics.

Schimel said that all the modeling centers that participate in IPCC must be extremely proactive in conveying to the IPCC that everything cannot be put into one ensemble and that the SRES's are obsolete.

5. **Other Topics.** COLA will host a second planning workshop in September to further investigations into the physical climate biases, and CCSM representatives will participate. Killeen stated that the CAB as a national advisory board on climate research should look at the summary of scientific objectives and make remarks about them.