

**Minutes of the Joint
CCSM Scientific Steering Committee and Working Group Co-Chair Meeting
Monday, 19 June 2006
The Village at Breckenridge, Blue River Room**

SSC Attendees: Peter Gent (Chair), Chris Bretherton, Steve Ghan, Bill Collins, Bill Large, Jim Hurrell, Julia Cole, Scott Doney, Gordon Bonan, Ben Santer, Mariana Vertenstein, Jay Fein, Dave Bader, Anjuli Bamzai, and Lydia Shiver

Working Group Co-Chair Attendees: Steve Jayne, Rick Smith, Elizabeth Hunke, Marika Holland, Phil Rasch, Leo Donner, Dave Lawrence, Steve Running, Jeff Kiehl, Zhengyu Liu, Sumant Nigam, Natalie Mahowald, Jim Randerson, Jerry Meehl, Peter Hess, and Pat Worley

CAB Attendees: Daniel Jacob, John Drake, Eric Sundquist, Dave Schimel, and Guy Brasseur

Guests: Jim Hack, Li Zhang, and Mike Moran

1. **Welcome.** Peter Gent welcomed everyone and asked everyone to introduce themselves.
2. **CCSM Implementation Plan.** Gent stated that the CAB requested an implementation plan. The draft plan states that the most important items to address for CCSM4 are the physical biases in CCSM3 (double ITCZ, ENSO frequency, continental precipitation, high latitude land temperatures, too large windstress, and too much Arctic low cloud); including some form of carbon cycle; and including the indirect effect of aerosols. Gent stated that the biggest possibility of severe failure is combining the updated carbon cycle with the new physical components in CCSM4. To avoid this failure, he proposed a three stage strategy.

Stage 1 (starting at the end of 2006) would include: a version of the biogeochemistry land model with CLAMP results, Ghan's aerosol indirect effect scheme, an updated finite volume (FV) atmosphere model, soil hydrology and frozen soil scheme in the land model, POP2 base code plus updates in the ocean model, merged CICE and CSIM codes in the polar component, resolution of FV 2.2x1.9, ocean x1. This would be a significant advance on current biogeochemistry control runs in the T31x3 CCSM3 model.

Stage 2 (completing by the end of 2007) would include: developments in all components designed to reduce the significant CCSM3 biases, Lipscomb's land ice component in prognostic mode, and CAM with a troposphere domain. Stage 2 would not include interactive chemistry unless it is found that there are appreciable effects of chemistry on the mean climate or climate sensitivity of the tropospheric model, because it is too risky and complicated to add both biogeochemistry and chemistry components at the same time.

Stage 3 (completing by the end of 2008) would give the CCSM4 community one year (2008) to validate and understand CCSM4 that includes biogeochemistry, indirect aerosol effects, and a land ice component.

Some questions are: Should CCSM4 include a dynamic biogeography component? What will be the target resolution (FV 2.2x1.9, x1 ocean)? Should we try to match the atmosphere and ocean grids? Should there be more vertical resolution in all components? Will a low-resolution version be needed in 2008?

Comments were:

- Bill Large stated that the current CCSM Implementation Plan is geared toward IPCC AR5, and it does not take into account all of the other development work going on with CCSM4. He also said that the spin up issue needs to be addressed.
- Bill Collins said that some upper atmosphere is needed for solar forcings and chemistry.
- Ben Santer said that detection and attribution results should be a very important issue and forcings should be decided early.
- Mariana Vertenstein said that you can now turn biogeochemistry on and off in CCSM3.
- Jay Fein asked if common forcing data sets are being developed by the major IPCC modeling centers so that model simulations intercomparisons are not confounded by different model forcing, especially for volcanoes and solar radiation.
- Dave Schimel said that a joint IGBP and WCRP meeting will be held in early August to produce a White Paper that will help to influence data sets and also scenarios for AR5.
- Peter Hess said that he did not agree that adding chemistry is risky and complicated; he stated it would be costly.
- Guy Brasseur and Daniel Jacob said that the indirect effect of aerosols is the only chemistry needed inside CCSM, and the rest of the chemistry could be done in timeslices and offline.
- Hess said that ammonia nitrate is not included in the chemistry; we need to find out how to do it, and add it for IPCC AR5.
- Collins asked what the process is to interact with the Chemistry-Climate Working Group (ChemWG) and if chemistry will be included for IPCC AR5? (Note: It was decided that updates on WACCM and ChemWG will be scheduled for the next SSC meeting.)
- Gordon Bonan said that software engineering support is needed to merge the dynamic vegetation and carbon cycle for CCSM4, and that land use change is very important to the physical climate.
- Anjali Bamzai said that DOE's target resolution is T85 plus subcontinental and regional scales.
- Santer said that larger ensemble size is needed for low-frequency SST variability.

- Large stated that more vertical resolution is being explored by the OMWG, LMWG will probably add some levels, AMWG is interested in increasing the vertical resolution, and the polar group would prefer to use the computational costs for this somewhere else.
- Eric Sundquist said that there could be a change in the information needed from climate modeling science, such as what is happening today, in a week, and in a month. The trend for AR5 could be impacts. For AR5 there could be multiple tracks of research, such as a carbon cycle model for long time scales, and another track with a higher resolution version of a physical model with scaled down scenarios (e.g., airborne fraction for CO₂ run to 2050 only to anticipate a dramatic change of what information people will want). A hierarchy of models would be needed to explore such things as extreme events, such as hurricanes.
- Sumant Nigam said that a strategy to solve tropical biases needs to be added to the plan.

Gent requested Leo Donner update the group on GFDL's plans for AR5 and its next model. Donner stated that additional computational resources will be used for physical component enhancement including dynamic vegetation and adding troposphere and stratosphere. He said that the timeline for their next model is about the same as the one outlined by Gent above, but they are not planning to go to a high-resolution model.

There was speculation about what IPCC will want to do differently from AR4, such as extreme events, regional modeling, and higher resolution models. Meehl stated that if the community does experiments that are interesting, then that will be the experiments IPCC has. The scientists can dictate more of what will be done for IPCC rather than the scientists being told what to do.

Doney asked what high resolution is. It was stated that the physical biases do not improve with higher resolution models.

A low-resolution version of CCSM4 was discussed, and Gent said he felt that it should be able to run at least 25 years per day. Large said that the SSC needs information and the requirements from the working groups on what low-resolution model is needed, if any.

There was a discussion about whether a present-day or 1870 control run was needed first and if both were needed. Collins said that CMS wanted an 1870 control run; Meehl stated that several modeling groups did only an 1870 control run; Collins stated that tuning forcings were needed first, along with an agreement on an error budget protocol; and the polar and ocean groups stated they needed a present-day control run.

Jeff Kiehl stated that aspects of CCSM3 AR4 were lost because one forcing at a time was not changed and the simulations analyzed before more changes were made. He asked if there was a commitment this time to doing one change at a time and analyzing the results to gain information.

Gent discussed computing and manpower resources needed. He stated that CCSM4 would cost 3-4 times more than CCSM3 computationally without chemistry, adding predictive aerosols would mean at least 4 times more computational power needed, and if chemistry was added, the cost would be much more. Gent stated that CCSM must add at least 3 software engineers to the group immediately, and Brasseur said that internal ESSL resources could be adjusted so that software engineers could be added. Jay Fein stated that the CCSM budget would be steady only. Brasseur stated that CCSM is an ESSL top priority. Fein stated he could argue for additional resources for NCAR to do the next IPCC but not for more software engineers to repeat the same scenarios as done for AR4. He said that Sundquist's input regarding the changing outlook for what IPCC and policymakers will be requesting for the next IPCC should be discussed. He thinks that we must have regional modeling by 2013.