

Report on CCSM Climate Variability Working Group Meeting

Sixth Annual CCSM Workshop, The Village at Breckenridge

Co-Chairs: Jim Hurrell and Ed Schneider

28 June 2001

The CCSM Climate Variability Working Group (CVWG) breakout session was held on Thursday, June 28, 2001 from 11:30 am to 3:00 pm, chaired by Jim Hurrell. Ed Schneider served as rapporteur. Prior to the meeting, talks had been solicited from members of CCSM community.

The resulting 14 presentations covered time scales from diurnal to decadal and analyzed many different geographic regions. The talks are summarized below.

Caspar Ammann (Univ. Massachusetts)

External Forcing and 20th-Century Climate in CSM. The response of paleo-CSM to volcanic aerosol and solar constant forcings derived from the climate record were examined. The variability of global mean surface temperature due to each effect is about 0.2C.

Cathy Smith (NOAA/CIRES)

A Web Based Program to View and Analyze CCM3 Climate Output. A web program that uses GrADS to look at CCM3 output has been developed and is available at www.cdc.noaa.gov/composites/CCM.

Aiguo Dai (NCAR)

Diurnal Variability in CCSM. The diurnal and semidiurnal tide in CSM and CCM3 were examined and compared to NCEP reanalysis. Dynamical fields (slp, u, surface T) compare well. Precipitation and clouds do not.

Craig Collier (Texas A&M)

A Comparison of CCM3 and TRMM Precipitation. A project to verify CCM3 precipitation variability using TRMM data is underway.

Grant Branstator (NCAR)

Effects of the Jet Stream Waveguide in CCM3. A waveguide effect associated with the jet stream is found to allow much stronger connections between different regions on the globe than might otherwise be expected. These connections can tie the NAO region to the Indo-Pacific warm pool.

Marilyn Raphael (UCLA)

The Relationship Between Sea Ice and the Large-Scale Circulation in the Southern Hemisphere. The influence of sea ice on Southern Hemisphere stationary waves (primarily wave numbers 1 and 3) was examined using CCM3.

Mike Alexander (NOAA/CDC)

The Atmospheric Response to Arctic Sea Ice Anomalies. Ensembles of 50 members were used to find the CCM3 response to Arctic sea ice extent. The response is characterized by strong local heat flux anomalies and by a large scale change in SLP. The circulation and precipitation are effected in the summer, and the feedback on sea ice formation is negative.

Fredrick Semazzi (North Carolina State)

A CCM3 Study of Deforestation Induced Climate Change in Africa. Deforestation of Africa in CCM3 reduces rainfall. Also, rainfall is reduced in Mozambique in the Southern Hemisphere summer, possibly due to Rossby wave propagation. The local precipitation response comes mostly from reduction of the horizontal moisture convergence.

Antonietta Capotondi (NOAA/CIRES)

Thermocline Variability in the Tropical Pacific. Decadal variability of the thermocline was examined by analyzing the behavior of the 25.5 sigma-theta surface in a simulation of 1958-1997 in the x2' version of NCAR CSM Ocean Model (NCOM). Maximum low frequency variability is found near 10S and 13N near where the curl of the wind stress changes sign and is attributed to propagating Rossby waves forced by Ekman pumping.

Rong Fu (Ga. Tech)

The Influence of Tropical Pacific and Atlantic SSTs on Amazon Rainfall. Eleven year simulations using CCM3 (annual mean SST, annual cycle SST in Atlantic or Pacific) were used to isolate the effects of the SST forcing in the Atlantic and Pacific on the annual cycle of Amazon rainfall. The West Amazon is not affected by SST. The East Amazon is forced by the Atlantic SST.

R. Saravanan (NCAR)

Assessing the Potential Predictability Associated with Tropical Atlantic SST Anomalies. Twelve member 1950-1995 Global Ocean Global Atmosphere (GOGA), Tropical Ocean Global Atmosphere (TOGA), and Tropical Atlantic Ocean Global Atmosphere (TAGA) ensembles made using CCM3 were examined. Knowing the Atlantic Sea Surface Temperature Anomaly (SSTA) gives predictability locally and over northeast Brazil. Some influence is also found in the southeast equatorial Pacific and in the Caribbean in June, July, and August. The North Atlantic response resembles the east Atlantic pattern rather than the North Atlantic Oscillation (NAO).

Jan Hnilo (PCMDI)

An Examination of the Sensitivity of a GCM to a Coupled and Uncoupled Mode. Ensembles of simulations made with CCM3 forced by the CSM 300 year control sea surface temperature (SST) have been made at PCMDI and are available for analysis. Compared to Atmospheric Model Intercomparison Project (AMIP) runs (observed SST), the ensemble has smaller variability and latent heat flux.

Ed Schneider (COLA)

Seasonal-to-interannual Coupled Retrospective Predictions Using CCM3/MOM3. Results from a set of 20 retrospective coupled forecasts made using CCM3 coupled to MOM3 were shown. Initial conditions were for January 1 1980-1999. Ocean initial conditions were generated by Tony Rosati and Matt Harrison at GFDL. Results are comparable to those obtained using COLA AGCM/MOM3 and ECHAM4.5/MOM3, and leave much room for improvement.

Jerry Meehl (NCAR)

Solar Variability and Climate System Response in Ensemble Simulations of 20th Century Climate. An ensemble of coupled transient climate simulations was made using solar, greenhouse gas, sulfate, and ozone forcing. Early 20th century solar forcing is stronger than later 20th century forcing. A stronger monsoon is found in the earlier period. Solar forcing dominates early in the century and infrared forcing later.

FUTURE PLANS

Several recommendations were made during the working group plenary session: (in no particular order)

- create and maintain a web index of existing simulations (e.g., AMIP ensembles, climate of the 20th century, climate change, retrospective forecasts, etc.).

- complete ensemble of retrospective forecasts using CCM3. This represents a new capability for Seasonal-to-Interannual (SI) predictability studies. Repeat with new CAM1, and move toward using Parallel Ocean Program (POP). Also useful as a coupled model diagnostic.
- continue to participate in analyses of simulations with the (new) coupled model.
- continue to provide a forum for individual researchers doing CCSM-related work.
- recommend that a suite of standard experiments should be maintained (e.g., AMIP ensembles) with the best current AGCM.

Finally, it was announced that Mike Alexander will replace Ed Schneider as co-chair of the CVWG. Ed was recognized for his many years of dedicated service to CCSM.

PARTICIPANT LIST

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