

Report on Visit of NCAR/CAS, CDP, CCR and NOAA/OAR/CDC for NWS STIP Climate Update – A Summary

by Jiayu Zhou

Jiayu Zhou of NOAA/NWS/OST12 visited NCAR/CAS (Kevin Trenberth), CDP (Joe Tribbia), CCR (Jerry Meehl) and NOAA/OAR/CDC (Randy Dole and Martin Hoerling) for the NWS Science and Technology Infusion Plan (STIP) Climate Part Update on 19 June 2003. Both institutes welcomed NWS opening its door to the research community and showed their support to the science and technology infusion for improving national climate prediction.

Purposes of the visit

- Deliver NWS STIP Climate R&D Needs to NCAR and CDC for improving climate prediction, especially the U.S. seasonal temperature forecast skill (the only GPRA performance measure for NWS climate services).
- Brief and explain to Kevin Trenberth the NWS response to his recommendations.

Visiting contents

- Gave a presentation entitled “NWS STIP Climate Recent Activities and R&D Needs Update” to each institute and discussed the issues that both sides concern.
- Showed Trenberth the OST analysis sheet and let him know the efforts that NWS had made seriously for responding to his recommendations. Asked him for further opinions.
- Discussed the idea of making independent model assessment, recently suggested by Prof. Donald Johnson, NWS/NCEP special project scientist.

Results

- CDC has developed tools for improving the week-2 forecast (Whitaker 2003), which can be delivered to CPC.
- Trenberth expressed his appreciation of the NWS response to his recommendations (see his e-mail to Jack Kelly dated 19 June 2003).
- Both CDC and NCAR give positive comments on the idea of making independent model assessment.

Recommendations

- The routine attribution study proposed by CDC and funded by OGP should be a part of the STIP. It is designed as a complementary performance measure by conducting the posteriors analysis to understand the climate predictability.
- The STIP performance measure should also examine the impact of new tools being introduced into the operation as an assessment to the science and technology infusion.
- Trenberth pointed out new problems in the current CDAS/reanalysis products and suggested to assess the effects of the continually changing observing system through routinely conducting observing system experiments.
- To improve the model, NCAR strategy is to make everything available to users, which include many research institutes and universities, and identify problems from their feedbacks. The NCEP/EMC should reach out to improve NCEP model, though individual situation could be different.
- To develop a strategy of model assessment, it is necessary to establish a common list of physical and dynamical processes or variables, which are able to help to understand the model deficiencies. This list should be contributed and fully discussed by modeling experts.

Issues

- Currently, there are no formal programs to support week-2 forecast. The resource issue for the STIP should be addressed.
- For the problem of current GPRA performance measure, Trenberth noted that part of the problem lies in how skill is defined. Skill relates to a signal to noise ratio and how well the signal is predicted. If there is no signal, NCEP has no control over that. It only has control over the noise in the forecast. He suggested that the metric should be re-examined.
- The skill score for the 6 months lead forecast of SST anomaly averaged over the El Niño region is seasonally dependent. It is not clear if the current skill score shown in the first version of the NWS STIP Climate (September 2002) is for a particular season or for the annual mean. It may also be important to add the performance measure of root mean square error in addition to the measurement of correlation. In addition, the area of global ocean should be considered to take account for the variability of major oceanic modes in different ocean basins.
- For the week-2 forecast, Tribbia called attention to the break of intraseasonal oscillation regime. He showed the NCAR CCM3 forecast skill degraded immediately after the phase transition. The similar behavior has also been confirmed in the NCEP and ECMWF models.
- The NCEP/EMC recent improvement in the couple model simulation is impressive. Since increased levels are mainly above troposphere, one possibility could be related to the sigma coordinate problem in the model upper layer. Using more levels could relieve the upper boundary condition problem.
- Trenberth showed his recent work on diagnosis of NCAR CCSM2 problems. One of the issues is that the convection starts too early in the model, not allowing CAPE to build up before initiation of the convection, and the triggering mechanisms (which could be gravity wave, dry line, gust front, etc.) is not correctly simulated (Dai and Trenberth 2003). This problem could be common to other models.
- Currently, OAR does not have the focal point for the water cycle and should build the link to the R&D needs for the water forecast and application.
- The solar forcing could be already built into the initial condition, when looking for the seasonal influence. While, how much could be impacted by the dynamical feedback process in association with ocean-land-atmosphere coupling that needs further investigation.

Information

- Coupled modeling study by Meehl shows that the solar forcing can reach to the lower troposphere and couple with the impact of surface property in less cloudy area (e.g. subtropical high region). The differential heating creates spatial anomaly patterns that change the temperature gradient and impact on the circulation. The precipitation is affected through nonlinear interactions. The solar forcing can also be enhanced by interaction with ozone and greenhouse gases. The follow-up study is focusing on the solar 11-year cycle, making composite of solar maximum minus minimum to look for similar signals in the real world.
- As pointed by Tribbia, the current AMIP is not design to tackle the model problems. It more focuses on individual model deficiencies with less consideration on the physical processes that cause the problem. Due to different research interests of model applications, the models have never been really compared in terms of basic physical and dynamical processes.
- Trenberth called attentions to his two recent papers, which can be downloaded from the NACR/CAS website www.cgd.ucar.edu/cas
 - Trenberth, K.E., A. Dai, R. Rasmussen, and D.B. Parsons, 2003: The changing character of precipitation. *BAMS*, will appear in the September issue.
 - Dai, A., and K.E. Trenberth, 2003: The diurnal cycle and its depiction in the community climate system model. *J. Climate*, submitted.