

Report of the meeting of the CMMAP Working group on Knowledge Transfer to Numerical Weather Prediction Centers

Chair: Christian Jakob (BMRC), 15 August 2006

Participants: Martin Miller, Celal Konor, William Rossow, Bo-Wen Shen, Steve Klein, Wanda Ferrell, Graeme Stephens, Richard Somerville, William Collins

The Working group had its first meeting during the inaugural CMMAP workshop from 15-17 August in Fort Collins. The group discussed ways in which NWP and CMMAP can engage in a fruitful dialogue and benefit from each others experience.

Initial thoughts

The group first highlighted the many facets of modern NWP ranging from global NWP, high-resolution regional NWP and data assimilation. It was pointed out that while global NWP systems are still far off the cloud system scale in terms of resolution, many NWP centers are now routinely running cloud-system resolving scale (1-4 km) models. It was stressed that CMMAP should engage with those centers to make use of their experiences. The group further noted that NWP activities receive no direct funding within CMMAP and will therefore have to remain somewhat at the periphery of the project. It was noted with concern, that none of the American NWP centers were represented at the meeting, even though a fair number of them are listed as partners in the project. It should be our aim to improve that situation as CMMAP evolves. The group then went on to discuss three major avenues of collaboration, summarized below.

Use of NWP techniques in CMMAP research

The most obvious technique that is useful to CMMAP is the use of NWP for model evaluation. The usefulness of short-range NWP forecasts in particular for the assessment of model physics has been demonstrated over the last decade. The most easily accessible methodology for CMMAP is the CCM3-ARM Parameterization Testbed (CAPT) at LLNL. CAPT is now well established and has fully integrated the CAM model, in which the MMF is currently implemented. Early CAPT experiments using the SP-CAM have been carried out a few years ago, but were not extensively analyzed. The group recommends that CMMAP and LLNL jointly revive the use of the technique to assess the MMF. (Action: CMMAP to approach LLNL to discuss CAPT-MMF experiments)

Another very direct connection between NWP and the MMF could be established if the MMF technique was implemented in an existing NWP system. The group recommends that CMMAP consider this as an option for future work (Year 2-3), but did not consider it a matter of urgency.

An important use of NWP techniques in the near future could be the execution of the "Big Brother" (BB) experiment using a regional NWP system. The BB experiment comprises the comparison of a high-resolution simulation (1-4 km) to the same simulation carried out at coarse resolution (~100 km) with the MMF embedded as the parameterization. After comparison to observations the high-resolution run would serve as a benchmark to assess

successes and failures of the MMF leading to its improvement. While still prohibitive on global scales, such experiments can in principle be executed quite easily in a regional system. The group noted that setting up such experiments could be a good way of engaging the American NWP community through the use of for instance the WRF model. It was felt that such experimentation should be given high priority.

Use of the MMF techniques to improve NWP

An important aim of CMMAP is to apply MMF techniques in such a way that NWP centers can directly benefit from its results. The group considers the use of the MMF for the development of parameterizations as one of the highest priority items. In this, the group does not distinguish itself from the group dealing with knowledge transfer to climate models. Informing parameterization development using the MMF by carefully analyzing its successes and failures was seen as one of the most important CMMAP goals. Careful experiment design and availability of the results of CMMAP experiments to parameterization developers were identified as the largest challenge in that respect.

The discussion revealed another direct way for the MMF to inform NWP, that had not been considered in the CMMAP strategy so far. Given the regional NWP model resolutions have reached that of Cloud System Models, the projects in CMMAP that aim to improve such models (e.g., their radiation, microphysics and turbulence representations) could directly feed into NWP model development. The group recommends for CMMAP to consider adding this to its strategy for interacting with NWP centers.

Data assimilation

The group briefly discussed the interaction of CMMAP with data assimilation efforts. It was concluded that while interesting, a direct use of the MMF in data assimilation is currently not feasible. It is recommended in the short term to concentrate the CMMAP-NWP interaction on model issues and to revisit the data assimilation issue if and when the MMF has been embedded in an NWP system.

Organizational matters

The group concluded that its aims and objectives have significant overlap with those of the knowledge transfer to climate models. It is therefore recommended to merge those two groups into a single one.

The WCRP Working Group for Numerical Experimentation (WGNE) is the best known representative of NWP internationally. The Chair of WGNE, Martin Miller, has kindly agreed to discuss possible expectations from and collaboration with CMMAP at the next WGNE meeting in October 2006 in Boulder. Given the closeness of location the group considered it advantageous if CMMAP representation for the WGNE sub-session discussing these issues could be arranged.