

Notes from the discussion of the new institute for CMMAP follow-on activities

CMMAP Team Meeting, August 6 – 8, 2013, Fort Collins

8:30 to 9:30 AM, Wednesday, August 7, 2013

Session chairs: Mike Pritchard and Robert Pincus

Rapporteur: Richard Somerville

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One of the goals is to arrive at concrete proposals that would lead to a continuation of what CMMAP has begun.

Although it is true that we are primarily a modeling effort, it is useful to keep in mind other things that we do, such as diagnostic work, and these are worth continuing too.

We have not yet merged the cloud-aerosol interactions work with the work on subgrid turbulence, and this is worth doing.

One of the best things about high-resolution modeling, either global CRMs or the MMF, is that we get away from the traditional GCM paradigm that an input to a parameterization is information from another parameterization.

One of the strengths is the opportunity to have a mini-LES nested too, as an ingredient in the mix of how to do turbulence in the MMF framework. Marat has had this on the back burner, but it may be right for prime time.

The ice phase is interesting, and we should want to investigate how much this affects the global climate, and how much of precipitation originates in the ice phase.

We can help NASA decide what belongs in the next generation of satellites too.

How does dust affect the ice phase? This is worth investigating.

The giga-LES is already useful, and NASA has found it useful. Much more can be done with this framework. Radiative forward modeling deserves being continued. Coupling with land surface is also in progress. This is allowing physics to operate more closely to its native scales, similar to the rationale for CMMAP.

New ice microphysics with dust is already being worked on collaboratively by Jill Zhang (Scripps) and Minghai Wang (PNNL).

Guiding satellite development for NASA is already happening at PNNL with the aerosol-enabled MMF. This deserves continuation.

PNNL focuses on aerosol-cloud-precipitation interactions, and there are many ongoing interactions that deserve continuation.

Suppose that people want to collaborate between institutions, then how does the new institution help with that? Answer: it cannot. There is no need for that. People can collaborate bilaterally. The institute can facilitate workshops. We have CMMAP for three more years, and CMMAP can help with that.

Bilateral collaborations can occur outside the new institute, just by scientists deciding to work together, but the new institute can facilitate interactions within the team by continuing valuable meetings like the CMMAP team meetings.

Radiation in the CRMs is one-dimensional (vertical), and without doing full 3-D radiative transfer calculations, there still needs to be work on radiative interactions horizontally (the sky does not go dark when a cloud is overhead). Comparable issues exist in the ocean.

Synoptic-scale tracer transport in mid-latitudes in winter is an exciting area for further work. Jet stream effects play a role. There has been emphasis on tropical systems, but baroclinic systems in the extra-tropics need attention too.

Diagnosticians interacting with model developers has been successful. Are there other such interactions between different specialties that should be nurtured and encouraged?

Some of the scale interaction issues do not require an MMF; they can be handled locally. Aside from tropical issues, another important scale interaction issue is low clouds and associated feedbacks. Mini-LES approaches are one possible direction.

Facilitating communications is an area where the new institute can contribute.

One thing we can do with a global model that the Japanese global CRM effort has not done is to add aerosol effects.

The GCSS, like the post-CMMAP institute, is not an STC like CMMAP, so it cannot fund people to do work, but it can stimulate and encourage and facilitate work, as GCSS has done.

Some issues of the MMF design that can and should be explored are associated with extra-tropical (baroclinic) systems. We have been focused on the tropics in CMMAP, but the extra-tropics are ripe for such work.

Cyber-infrastructure is an area of CMMAP that individual PI-level work cannot easily address, but that deserves attention, in areas such as the data provenance and reproducibility and quality control issues that John Helly discussed at this meeting.

The Japanese global CRM will soon run a grid less than 1 km, for which a 12-day integration is feasible. But the 10 km resolution for global Earth system models will still be the standard at, say, 10 years from now. So the institute can adopt framing these CMMAP legacy issues as part of its purpose. This resolution is still a long way from resolving the scales appropriate to aerosol interactions.

The research on dynamical frameworks that Arakawa and his collaborators have pioneered deserves to be continued. This has already attracted non-CMMAP funding.

Another worthwhile multi-scale land surface topic to pursue is smoke emissions. Studies have been proposed (“pyrocumulus”).

What has CMMAP provided to grad students and postdocs that needs continuing? The events that are specifically aimed at younger people, such as the grad student colloquium, have been very worthwhile and are well worth continuing. The team meetings that provide feedback to grad students have also been very valuable.

One of the strengths of CMMAP is that it does both numerics and physics, and we need to keep that valuable collaboration active.

We can do additional work with John Marshall’s group at MIT. It is important that climate modeling go on at places other than the national labs. We are an example of university-based research in this area, and that needs to be continued.

The last decade in the labs has seen a big influence occur from CMMAP, and that is worth continuing. The interaction with work at the labs that CMMAP has nurtured has been very valuable.

New developments in coupling to land surface models are promising. For example, wet vs. dry season coupling in Amazonia. The work done with the MMF on convective systems that generate significant fractions of summertime precipitation in the central US is another example.

High-resolution issues are important too. We ought to have 90 vertical levels in SP-CAM instead of about 30, and this can be done. A black box approach to incorporating super-parameterization in any model ought to be feasible. The GPU approach is also well worth pursuing.

The MJO has been a “Holy Grail” in tropical studies. In connection with land-surface work, the effects of land surface changes on climate is a topic that deserves studies with the MMF approach. Also, when and how does a model make the rain vs. no-rain decision? Intermittent precipitation is needed to simulate tropical variability well. Precipitation initiation is generally not done well in models.

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