

GMPP Panel Report to the 2010 GEWEX SSG Meeting

Panel Name (Acronym): GEWEX Modelling and Prediction Panel (GMPP)

Reporting period: 2009

Chair(s) and term dates: Christian Jakob (extended to N. Hemisphere Fall 2010)

Objective(s):

GMPP's role is to coordinate the activities within GEWEX that aim at improving the representation of the global water and energy cycle within Earth system models. Furthermore it coordinates collaboration with modeling and related observational activities within and beyond GEWEX. Particular focus areas of the work of GMPP are cloud systems, land-surface processes and the atmospheric boundary layer (ABL). To address these difficult areas of parametrization adequately, GMPP is organized into three activities:

- The GEWEX Cloud System Study: GCSS
- The Global Land/Atmosphere System Studies: GLASS
- The GEWEX Atmospheric Boundary Layer Study: GABLS

Progress report:

The main activities of GMPP take place in the three study groups mentioned above and are summarized in the progress reports of those groups.

The activities at the GMPP-level are now synonymous with the activities of the WGNE sub-group on physical parametrization as the latter essentially consists of the project chairs of GCSS, GLASS and GABLS. They largely relate to activities in support of model development that are organized through WGNE/GMPP. The annual joint meeting of WGNE and GMPP took place in November 2009 and this progress report as well as the plans below largely relate to activities discussed at that meeting.

WGNE/GMPP have initiated a WCRP-wide survey on model development across all application areas (see Appendix 1). A first call for responses went to the community in August and yielded about 75 responses. The main areas for future model development that were highlighted in an early analysis of the responses to the survey were:

- Tropical biases and errors in tropical variability often associated with the representation of tropical deep convection;
- cloud-climate feedbacks;
- the carbon cycle; and
- the representation of physical processes in high-resolution (O(5 km)) models.

The analysis of the responses is ongoing and the above should be seen as emerging themes rather than final conclusions. At the last WGNE/GMPP meeting the Numerical Weather Prediction (NWP) community expressed interest in becoming more actively involved in the survey and it was decided to carry out a second call for responses this time including the WWPR/THORPEX community as well. The call was sent in early December with a 15 January 2010 deadline. It is anticipated that the results of the survey will be published in a BAMS-like article. They will also serve as the foundation for a workshop on "Physical processes in Earth-System Models" planned for early 2011. See the plans section of this report for more detail.

Other projects that are ongoing and involve GMPP through the WGNE connection are:

- Transpose the Atmospheric Model Intercomparison Project (AMIP): This project tests climate models in NWP mode. The project has completed its first phase and is headed into a second phase with the support of the European Framework 7 EUCLIPSE project on cloud climate feedbacks.
- Aquaplanet experiment (APE): This project is now finished and has yielded very interesting results. Climate models are run on an aquaplanet with a sequence of different prescribed distributions of sea-surface temperature (SST). Remarkably there is very little agreement between the models response to changes in the SST pattern. Currently there is no simple explanation for this behaviour. The project will be phased into CMIP5 and hence the model output will be widely available for analysis.
- Metrics for climate models: A climate model metrics panel has been formed and is in the process of defining a standard set of climate model metrics for application to the CMIP5 models. Robert Pincus is the GCSS and hence GMPP representative on the panel.
- Year of Tropical Convection (YOTC): YOTC is working very closely with the model development community and with the strong response on tropical model errors in the survey is likely to become central to some of the GMPP activities in the years to come. The transpose AMIP project already uses YOTC as its core period of investigation.

Plans for 2009:

The GMPP study groups will continue their efforts as outlined in their individual reports. At the GMPP coordination level much of the work will focus on the collaboration with the WGNE effort, as GMPP is the core of that effort.

Some of the core activities that involve GMPP at the coordination level are:

- Plans for a workshop on physical processes in Earth-System Models are now firmly in place. An organizing committee will be formed within the next few months with its core consisting of Joao Teixeira (JPL), Pier Siebesma (KNMI, GCSS chair) and Christian Jakob (Monash Uni, GMPP chair and WGNE co-chair). The aim of the meeting will be to formulate strategies for accelerating progress in the model development areas that are highlighted by the responses to the community survey currently underway (see above).
- Contribute to the organization of the WCRP conference in 2011 with a particular aim to ensure that model development is well represented at the meeting. Christian Jakob is on the organizing committee.
- At the WGNE meeting it has come to our attention that many model projects are saving high-time resolution output at carefully chosen grid-points that coincide with major measurement sites, for instance those of the ARM or CLOUDNET programmes. Examples for modelling projects doing so are CFMIP and transpose AMIP. This, taken together with the fact the operational centres already store this information routinely, opens the possibility for a joint GMPP-CEOP project on model evaluation. Our plan is to explore this possibility at the GEWEX SSG meeting.
- Reanalyses are used by the entire community and yet, at almost every occasion it becomes clear that financial support for generating them is increasingly difficult to find by all centres engaged in producing them. WGNE/GMPP propose to organize a high-level support letter from the entire WMO community in support of reanalyses.

New directions:

GMPP in its coordinating role will continue to work with WGNE as our core partner.

A new emerging direction in the community is the generation of so-called parametrization test-beds, such as the one currently running at KNMI for the European community and the one under development by the US Department of Energy Atmospheric Radiation Measurement (ARM)

community. Those test-beds are essentially automatic systems that run single-column models routinely every day in real time and compare their results to observations taken at the highly instrumented ARM and CLOUDNET sites. As these activities involve the entire single column model they essentially integrate the research interests of all GMPP projects. They therefore constitute a great opportunity for a GMPP-wide activity in model evaluation. It will be a focus of 2010 to investigate how GMPP can link better with the existing activities.

Recommendations and issues for attention of the SSG:

- Congratulate the GMPP study groups on their continued success in supporting the community's efforts in parametrization development and endorse their plans for 2009.
- Approve GMPP's further involvement in the activities discussed above.
- Discuss approaches to a community-wide support for reanalyses

Summary

GMPP remains at the heart of the implementation of the model development activities in WCRP that resulted in a new expert group on parametrization within WMO under the auspices of WGNE. The role of this group is to advise all WMO activities in the area of parametrization and to set the agenda for parametrization development activities. The existing GMPP study groups form the core of this activity. Through the GMPP groups GEWEX continues to drive progress in this very important area of research.

List of meetings, workshops

November 2009, WGNE-25/GMPP-11, Frankfurt, Germany

Planned meetings, workshops

Pan-GEWEX meeting, Fall 2010
18-22 October 2010, WGNE-26/GMPP-12, Tokyo, Japan

APPENDIX 1 – WCRP/WWRP survey on model development



Subject: Community-Wide Consultation on Model Evaluation and Improvement

To:

- NWP and Seasonal Forecasting Centers
- World Climate Modeling Centers
- WWRP incl. THORPEX community
- WGCM and associated MIPs (PMIP, CFMIP, C4MIP, etc)
- CLIVAR modeling groups (WGOMD, WGSIP)
- CLIVAR regional and monsoon panels
- US CLIVAR panels and working groups, CPTs
- WCRP Task force on Regional Climate Downscaling
- WCRP Projects (CLiC, SPARC, GEWEX)
- THORPEX, WWRP
- IGBP/AIMES

From:

Sandrine Bony, Gerald Meehl, Anna Pirani (WGCM),
Christian Jakob, Martin Miller (WGNE),
Ben Kirtman (WGSIP), Stephen Griffies (WGOMD), Tony Busalacchi (WCRP)
Gilbert Brunet (WWRP), Alan Dickinson (THORPEX)

Errors in climate (ocean-atmosphere-land-ice) and NWP general circulation models substantially limit the skill of climate and weather predictions on a wide range of space and time scales. Identifying these errors and understanding their root cause constitutes a prerequisite for the planning of model improvement activities. On the other hand, translating the wealth of results from process studies, observational campaigns etc. to model improvements is a non-trivial issue for the modeling community.

For this purpose, we propose to initiate a "bottom-up survey" about the key deficiencies of regional and global NWP and climate models. This survey includes problems identified in operational NWP and seasonal prediction centers as well as deficiencies that climate modelers and analysts of CMIP3 simulations have identified for the current generation of models. The priorities identified by the survey will be the basis of model development/improvements across the entire WCRP Projects and activities, and also through its partnership with WWRP, IGBP and ESSP. WCRP is also currently examining the scope and structure of its modeling activities and the outcome of this survey will also inform these decisions/discussions.

We are asking modelers, analysts and process-orientated panels and international projects six targeted questions – see the template overleaf. The success of the survey in identifying priorities and opportunities depends on the involvement and enthusiasm of the participants in the survey either by sharing results and/or identifying actions to be taken.

The main purpose of the survey is to provide input to the strategic planning for model improvement activities that could be coordinated through the various working groups, projects and panels of WCRP and WWRP. Suggestions for such coordinated activities are welcome. Results from this survey will be reviewed and discussed at the next WGCM and WGNE meetings. The information collected by this survey, including details, links and references on relevant ongoing and new activities (regional observational studies, observations, process modeling studies, theory, etc) will be made available by means of a community resource website and a white paper will synthesize the outcomes of this survey and make recommendations on where international coordination is needed for the development of the next generation of models.

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Please complete the survey by 15 January 2010 and submit your response electronically to Anna Pirani at apirani@princeton.edu



Community-wide Consultation on Model Evaluation and Improvement

Please complete the following template by writing your answers into the boxes below the questions, sending any supplementary material such as clearly labeled figures in a separate file. Please submit your response electronically by **15 September 2009** to Anna Pirani at apirani@princeton.edu.

Q1: Please state your particular area of interest, e.g. global or regional climate or NWP modeling, seasonal prediction, sea-ice feedbacks, monsoons, troposphere-stratosphere exchanges, etc.

Q2: Given your interest, what would you consider/identify as the KEY uncertainties/deficiencies/problems of current models? What do you think should be evaluated/improved as a priority in models in terms of parameterization and/or interactions among processes? (Give references and/or one key figure where possible)

Q3: Do you see a particular gap (in knowledge, in observations or in practice) that would need to be filled, or a particular connection between different modeling communities or between modeling, process studies and observations that should be made a priority?

Q4: Do you see any particular resource or opportunity within the modeling/process study/observational/theoretical community (e.g. new results, new observations) that would be particularly useful and should be exploited to tackle this problem?

Q5: What would best accelerate progress on the topics raised in questions 1-4? Do you have suggestions for new initiatives (new process studies, field campaigns, or new collaborative approaches, eg international Working Groups, Climate Process Teams)?

Q6: Any other suggestions/issues to be raised?