

Report on HAP and Extremes

HAP

The scope for substantive review of the HPA activities was limited by the fact that the CEOP report provided no substantive information on the last year's HAP activities (a written report had apparently not been received) and HAP leader Eric Wood had not been invited to attend the SSG. We note that it is important to have a formal record of achievement since the last SSG and a clear statement of strategic direction. However, a PowerPoint presentation (presented by Denis Lettenmaier) provided information on substantial progress in 2009 and a strong programme of planned work for 2010.

We welcome CEOP's reported ambitions to develop further integration of HAP with other parts of CEOP and with other related programmes. This includes:

- land modelling, using the data from DIAS to develop physically coherent fields of land surface states and fluxes
- continuation of work on seasonal forecasting of drought, in cooperation with the Hydrological-Atmospheric Pilot Experiment (HAPEX) and flood prediction and climate change impact analyses in cooperation with the Global Earth Observation System of Systems (GEOSS)/Asian Water Cycle Initiative (AWCI).
- integration with the third Global Soil Wetness Project (GSWP-3) and with work underway as part of the GEWEX Global Land Atmosphere System Study (GLASS) and the LandFlux activity that has been launched by the GEWEX Radiation Panel (GRP) with GLASS

The PP presentation defined HAP's focus areas as:

1. Seasonal hydrologic forecasting.
2. Water cycle and drought monitoring
3. Climate change projections and adaptation.

It would have been helpful to have a clear statement of the overall objectives of the HAP programme, and also a summary slide to conclude.

A range of very positive achievements was reported. The programme reported productive collaboration with HEPEX. A joint workshop had been held on Post-Processing and Downscaling of Atmospheric Ensemble Forecasts for Hydrologic Applications in Toulouse, June 2009, hosted by Meteo-France, a test-bed project had been established, and two further workshops were planned.

More generally, HAP was developing the science behind skillful ensemble hydrologic seasonal forecasts, and demonstrating their usefulness. Seasonal forecast skill using DEMETER and CFS had been evaluated in 2009; in 2010 hindcasts will be generated for all the current RHP regions. The aim is that RHPs should identify testbed activities, and groups to evaluate the hydrologic ensemble forecasts. HAP members will continue to participate in the GMPP GLACE-2 experiment to assess the role of using soil moisture initial conditions to improve seasonal forecasting. *A challenge was identified to establish an archive of seasonal forecast model hindcasts.* It was also noted that NOAA is implementing an experimental Ensemble Forecast System (XEFS) for US application, which builds on GEWEX results.

The SSG had identified linkage with RHPs as a priority. HAP would like to establish test-beds in the RHP regions, but needs help from CEOP leadership and IGPO to encourage the RHP coordinators to identify these test-beds and to identify collaborators. We presume that this comment refers to water cycle monitoring, rather than seasonal forecasts – this was not clear from the presentation.

Global monitoring of the water cycle (snow, soil wetness) remains an ambition. HAP will try to work with other GEWEX activities and weather centers to obtain real-time data that will allow for such estimation, but *needs help to facilitate this*. It is not clear what help would be needed, this should be specified.

Concerning climate change projections and adaptation, the SSG had noted the need for guidance to the hydrological community to support the management of extremes. HAP had developed future drought scenarios using AR4 projections and initiated downscaling of AR4 projections, (to be completed early in 2010). It was proposed that HAP organize a workshop on “climate change adaptation in hydrology and water resources.” *Advice on co-sponsors was requested*. We note however that the science issues underlying the understanding and quantification of extremes are broader than HAP, and an issue for wider debate within GEWEX in general and the Extremes initiative in particular.

A query was raised concerning the adequacy of requirements specified by GEWEX for archived IPCC AR5 model runs. Analysis of heavy precipitation and flooding requires archiving precipitation data at time resolutions of 3-hrly or finer.

SSG had raised concerns about the membership of HAP. It was acknowledged that HAP needs to broaden participation, but barriers include funding to participate and the separation of hydrological and meteorological services in most countries. Nevertheless, HAP collaborations with HEPEX involve many scientists from every populated continent, discussions began in 2009 with UNESCO-IHE concerning potential collaboration, and during 2010 HAP/HEPEX will develop plans to collaborate with the Asian Water Cycle Initiative.

Concerning other future plans, it was reported that in water and energy cycle monitoring, HAP has established ties with UNESCO for African drought monitoring, and discussions have started with WMO and GEO for drought. There is potential collaboration with GMPP and GRP that needs to be developed and WGs populated. In seasonal prediction, a Working Group needs to be formed to develop plans for specific experiments that test/evaluate seasonal hydrological forecasts, much like GLACE-2. This requires that HAP develop collaborations with GMPP. Initial discussions with M. Best have been initiated. Some members have already been identified.

In decadal to century projections (action item from the 21st Session of the GEWEX Scientific Steering Group), HAP is forming a WG related climate projections and adaptation. Some action items from the 21st SSG have already been started (e.g. HAP has already analyzed 21st C drought projections.) as presented earlier. With the IGPO, a potential WG chair has been identified.

Links with GWSP had been limited by GWSP reorganization. The 21st SSG proposed a GEWEX/GWSP workshop targeted on water availability. *Questions were raised concerning the participation of CEOP in general, and the RHP's in particular.* Plans for a GEWEX/CLIC workshop on high latitude and cold regions hydrology and land surface models were under development.

The rapporteurs' comments are as follows:

1. They note significant achievements, and a very substantial and promising programme of future work. However, they have concerns that with current levels of scientific support, these are over-ambitious, and will need prioritisation. The issue of broadening the membership of HAP remains important, although significant progress had been made in establishing collaborative initiatives.
2. They welcome the proposals for greater involvement with the RHPs, but note that a two way interaction is needed, with data informing modelling and vice versa. They support HAP's request for support from the RHPs in achieving this.
3. They note the need for complementarity with the Extremes activity and understand that discussions have already taken place. HAP will need to consider its role with respect to this initiative.
4. Within CEOP there was a strong focus on HAP as the main vehicle for connection with the user community. Two points arise:
 - a) There is a danger that this places too great a load on HAP; there should also be user engagement in the results of other aspects of the CEOP programme.
 - b) As emerged in discussion, there needs to be careful consideration of the interface between HAP and the user community, and we support the view that HAPs' role should primarily be aimed at provision of methods and not tools.
5. They welcome Denis Lettenmaier's comments that HAP should not be regarded as the main hydrological element of GEWEX - hydrological science forms a key part of the development of improved LSS schemes, and of the need for integrated observational platforms. We note an extensive discussion in SSG of the potential for linkage with the hydrological community concerning the science of extremes under climate change and its translation into guidance for practitioners.
6. It would seem timely, particularly given the arrival of Denis Lettenmaier as co-Chair of CEOP, to clarify the scope and strategic objectives of HAP, and the broader role of hydrological science within GEWEX.

Extremes

This cross-cutting project, jointly led by GEWEX and CLIVAR, had chosen to focus on drought in the first instance, and had made a promising start to the development of an inclusive and collaborative project. A programme of workshops was in planning and an invitation to wider participation had been published in the GEWEX newsletter. The project had the potential to link strong user interest with the development of new science underpinning the occurrence of extremes and improved methods to evaluate potential effects of climate variability and change. The initial focus on droughts was reasonable, although it was noted that a sequential approach put the evaluation of

other extremes (such as heavy precipitation) in a queue. However, given logistical constraints this was agreed to be the best way forward.

A separate discussion note on Extremes is provided by Ron Stewart.

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