Rapporteur Report GHP

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We congratulate the members of the GHP for advancing the role of Hydrological Sciences within GEWEX, in particular regarding:

- The organization of the GEWEX Hydroclimatology Panel (GHP) around Regional Hydroclimate Projects (RHPs) and diverse crosscutting science topics.
- The interactions with other panels of GEWEX including GDAP, GLASS, and programs like CLIVAR, the Climate and Cryosphere, and the WCRP Working Group on Regional Climate (WGRC).
- The Active, Initiating, and Proposed Regional Hydroclimate Projects and GHP Crosscutting Projects evidence their pertinence and relevance, not only in their objectives, but also in their results so far as measured by the scientific highlights.

Kudos:

- The RHPs and the Crosscutting Projects have made pretty important contributions to answer the GEWEX science questions regarding:
  - (i) Observations and Predictions of Precipitation,
  - (ii) Global Water Resource Systems
  - (iii) Changes in Extremes
  - (iv) Water and Energy Cycles

- Likewise, the GHP have made relevant contributions to the WCRP Grand Challenges in topics such as:
  - (a) Provision of skillful future climate information on regional scales.
  - (b) Regional sea-level rise.
  - (c) Cryosphere response to climate change.
  - (d) Interactions of clouds, aerosols, precipitation, & radiation and their role in climate sensitivity.
  - (e) Past and future changes in water availability.
  - (f) Science behind the prediction and attribution of extreme events.

Kudos (3)

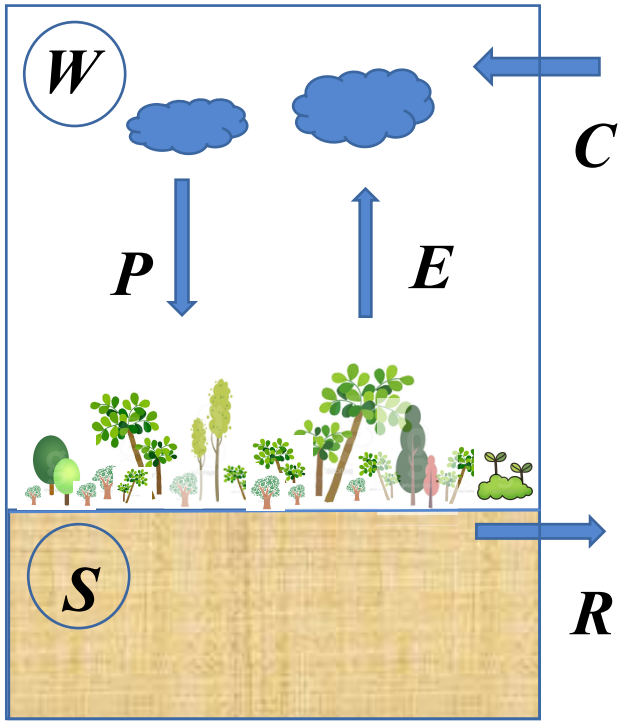
All these achievements have been accompanied by a strong agenda of meetings and workshops, and concreted in a strong body of scientific literature in high impact peer-reviewed journals.

Special thanks to Jan for his outstanding effort and leadership in the last five years.

Room for improvement (1):

- 1) The GHP seems pretty biased toward precipitation(P). The roles of Soil Moisture (SM) and Evapotranspiration seem relegated to GLASS, but these are main components of the water balance equation. (HyMEX appears to include full water cycle)
  - River Flows are just of marginal interest in GHP, let alone their connection with Precipitation, Soil Moisture and Evapotranspiration. Recall that River Flows are also a Climatological Variable, as per the coupling between the Surface and Atmospheric branches of the Long-Term Water Balance Equation:
- 2) Somehow, groundwater is also marginalised of the discussion. Let alone the interaction between surface water and groundwater, which provides streamflows during dry periods.
- 3) Is there any interest/aim in dealing with water quality? It is very much linked to water quantity and its variability at a wide range of spatial and temporal scales.
- 4) The program is focused on the “offer” part of water, the “demand” part is not considered extensively. For instance, the proposed scientific meeting in Banff next year is aiming at Extremes and Water for the Food Basket. The latter one brings about the demand side of the issue. If so, water for all types of consumptions is important (human, agriculture, industry, etc). A decision needs to be made in this regard.

Two-box model of the hydrological cycle



Water balance equations

$$\partial S(t)/\partial t = P(t) - E(t) - R(t) \quad (1)$$

$$\partial W(t)/\partial t = -P(t) + E(t) + C(t)\,, \quad (2)$$

In the long-term (t → ∞)

$$\langle R \rangle = \langle P \rangle - \langle E \rangle \quad (3)$$

$$\langle C \rangle = \langle P \rangle - \langle E \rangle \quad (4)$$

And thus $\langle R \rangle = \langle C \rangle$

Therefore, river flows are a fundamental Climatological variable of the net transport of moisture by the winds within river basins.

Room for improvement (1 cont):

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Room for improvement (2):

- It sounds like the US RHP is intended to be more related to applications, so maybe some of previous page of comments could be used to guide its formation.
- More interactions with GLASS seem possible. Aside from the fluxes, the RHPs will have local understanding of the meteorology data (for forcing land models) and the geography (soil and veg characteristics, topography). The offline land modeling in GLASS is very much local and GHP (or the RHPs) have a lot of local knowledge to offer.
- The GDAP cross cut needs further development. Build on the work John Roads was doing in the early 2000s?
- The Cold Shoulder work seems really interesting. However, how does this fit with the overall GEWEX questions/plan? Is it just extremes? Perhaps needs articulated better

Recommend

- Give concrete steps to materialize the proposed:
  - MOUNTerrain (Mountainous terrain precipitation).
  - Including water management in large scale models
- INTENSE – A good effort, can it incorporate model component (model inability to reproduce diurnal cycle of precip)?