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GEWEX Report

1. Highlights for JSC

Overarching Highlights

Since its inception, GEWEX has focused principally on understanding processes that shape the water cycle and energy balance of the planet. This process-oriented approach has engaged both process modeling activities, including parameterization assessment, with observation activities ranging from local to global scale (e.g. satellite measurements). GEWEX has evolved from its earlier phase where data records were developed and maintained to today where observations are integrated with a more Earth-system like framework and where observations are now tailored for process understanding. There are a few organizing themes that frame the integration of observations and process studies. These include:

- GEWEX-based estimates of the energy and water budgets of Earth that involve a complex integration of many sources of data. Advances that are occurring include:
    - A newly developed focus on quantifying the Earth's energy imbalance (EEI), a component of the global energy budget (see 3 below).
    - Regional depictions of the energy imbalance. Although the earlier studies provide our best representation of the global view, regional distributions provided in these studies contain significant uncertainties. Attempts to incorporate ocean heat transport to address clear biases in these regional depictions show great promise.

- Stewardship of the various components of these budgets and other relevant inputs is provided under auspices of GDAP.
    - This has not only involved oversight of data product maintenance but also careful assessments of the data itself. These assessments have been an invaluable service to the community and an important new assessment, focused on precipitation, is underway. Other assessments either just finished or are in stages of development include a cloud assessment update, a water vapour assessment (finished) and an aerosol update. These assessment activities are community driven and an important function of GEWEX and WCRP.

- Creation of new process-centric evaluation of model physics.
    - The newly formed GASS panel focuses on moist atmospheric processes and strongly linking to WWRP goals as well as GEWEX efforts.
    - GEWEX has created an entirely new processes evaluation program that focuses on using observation in new and creative ways to examine processes and evaluate models. Three main efforts of different scope and size have already provided important understanding, fruitful assessment of models and have even

served as a basis for a newly selected satellite mission by NASA (PREFIRE). Two of these activities fall under the new GASS.

- Integration of satellite- and extremes-focused research communities, under the auspices of GDAP and the Extremes GC
    - This activity is a joint GDAP and Extremes GC initiative which aims at assessing the suitability of satellite-based precipitation data for subdaily estimates and extremes
    - A workshop will be hosted in July 2018 at the GPCC headquarters to bring the communities working on GDAP precipitation assessments and on the GC extremes together and to design joint analyses and assessments

- Creation of new soil activities with strong connection to GLASS
    - Soil researchers were traditionally not integrated within the GEWEX community, but new global datasets and theoretical advances in soil sciences could strongly benefit the land modelling community
    - New joint activities, including a modelling experiment using new soil datasets have been initiated

<u>Further selected</u> Panel highlights

- *GDAP highlighst:*
    - GDAP provides a remarkable service to the climate community providing essential data stewardship of critical climate data records and in developing strategies to integrate these data into an integrated view of the Earth system.
    - A joint GEWEX/CLIVAR activity is developing around the need to quantify Earth's energy imbalance. A workshop conducted in October 2017 identified steps forward to develop activities that would advance global estimates of the EEI. A GDAP working group has been formed to assess the capabilities of new satellite approaches that offer the promise of mapping the EEI regionally
    - Ongoing and recently completely assessments of critical climate data records, including a new precipitation assessment (e.g add lin to water vapour assessment)

- *GLASS highlights*
    - Despite the limitations inherent in metrics-driven model intercomparison projects that have focused on land-atmospheric couplings, the PALS Land sUrface Model Benchmarking Evaluation pRoject (PLUMBER) experiment has made the land surface modelling community acutely aware of the capacity for improvement in state of the art land surface models. The incorporation of iLAMB in this effort exemplifies the strong link with carbon/biogeochemistry communities represent by iLEAPS (Future Earth)
    - Strong contribution of GLASS community to the 6th phase of the Coupled Model Intercomparison Project (CMIP6) experiments through the Land Surface, Snow and Soil Moisture Model Intercomparison Project (LS3MIP) and the Land Use Model Intercomparison Project (LUMIP). LS3MIP additionally provides an

important interface to the CliC community. Major insights on the role of land surface processes and land use forcing for climate change scenarios will result from these experiments.

- GHP Highlights:
  - Continued development of the Regional Hydroclimate Projects (RHPs). Mature RHPs (HYMEX, CCRN, Baltic Earth) are very successful and have foreseen continuation. New initiatives are being developed in Central Europe (PANNEX) as an initiating RHP and Latin America (ANDEX) which is in its definition phase. These projects generate strong regional and even global interest.
  - Cross cutting activities are vibrant although three (INTENSE, INARCH and Prec-near-0c) are near their end. Continuation is expected and a new CC on water security is being developed in collaboration with the Third Pole Environment program

- GASS Highlights:
  - GASS has been refurbished and a very successful conference was held in Australia to define future directions and how to strengthen collaboration with WWRP and WGNE. This discussion will continue during the GEWEX Open Science Conference in May.
  - A theme of focus that will connect GLASS and GHP with GASS is the planetary boundary layer.

2. Primary science issues (ahead, 3 to 5 years)

- GEWEX has now reached its 30th year. It is time now to both reflect back on and advertise achievements of the project and forward articulating the directions ahead. This will involve a revisit of the vision and mission statement of GEWEX and its four science questions. 2018 will see a new GEWEX strategy document in conjunction with the WCRP strategy document;
- Continue to expand on the human component in GEWEX's core activities in particular with respect to GC on Water, Modeling of Land-Atmosphere interactions and Hydrological Modeling, and the GLASS panel activities
- Continue Extend the Process Evaluation Studies to support model development (with the other core projects)
- Support continuation and embedding of the GEWEX endorsed Global Data Products both on state variables and fluxes (at operational centers e.g. NCEI) and define future requirements for future missions
- GEWEX is to play a major role in the newly forming WCRP-model precipitation assessment activity both through the observational assessment efforts of GDAP and through PROES activities that focus on precipitation-centric processes.
- Expand climate modelling activities in the context of CMIP6. It is the first time that GEWEX-sponsored CMIP experiments have been planned, Science issue 1

3. Issues and challenges:

- Working with other Core Projects.
  - In general very constructive and positive!
  - CLIVAR: In general working fine (e.g. interactions within GC Extremes). Monsoon Panel can still function better. The Ocean Heat Content activity is now

well merged with Earth Energy Imbalance (EEI) activity under joint leadership. Other than lack of financial (meeting) support much has improved.
    - CLIC: Continued collaboration on CMIP6 experiment “Land surface, snow and soil moisture MIP” (LS3MIP). New activities on PROES that are shaping up well. We have many cryosphere related activities that not always overlap with CLiC however, so far is not a critical issue has been identified.
    - SPARC: With the revamped GEWEX GASS panel we expect more or renewed collaboration. In particular, with respect to Process Evaluation Studies (PROES) as well as troposphere/stratosphere interactions and deep convection. These are new activities so take time to take shape.
    - CORDEX: Mainly through our Regional Hydroclimate Projects and some modelling activities. There is room for expansion but needs time and funds to realize.

- How do you work with CMIP and the modelling groups (vis-à-vis WMAC)
    - Continued from last year. Most of our work toward CMIP is done through activities with the GEWEX GLASS panel, in particular in the context of two GEWEX-sponsored CMIP6 experiments: The “Land surface, snow and soil moisture MIP” (LS3MIP) and the “Land use MIP” (LUMIP). There is also a strong involvement and coordination role from GEWEX in the “HighResMIP” CMIP6 experiment.

- How do you address observations/data requirements (vis-a-vis WDAC)
    - GEWEX continues to address the observational requirements needs to a) monitor earth processes and define instrumentation –requirements-, b) perform process studies and their requirements and c) execute assessments of data products (e.g. water vapor, precipitation). ((Data Assessments).)

- How you work with Grand Challenges
    - GEWEX leads and supports the development of two GCs namely Water and Extremes.
    - The GC Extremes is coordinated in collaboration with CLIVAR. This activity is evolving strongly and in 2018 it has a strong focus at the GEWEX OSC as well as several important side events.
    - The GC Water has established the “Water for the food baskets of the world” as a framework for its activities. The new RHPs have taken this up quickly as being central to their efforts. In addition strong interest has been shown by the various development banks.

- How you see your community evolving
    - Our community is constantly changing around a core group of dedicated volunteers. We are expending our activities in Asia, Africa and Latin America while hoping to maintain our efforts in North America and Europe.
    - With respect to ECS we embed them in our core activities and support and encourage our panels in outreach

- How you work with WCRP
    - We work primarily with WCRP through our JPS Scientific Officer which is going extremely well. We have interactions with the JSC Chair to a certain extent but much less with the D/WCRP and other staff (exception the consultants).

- How we work with Future Earth
    - GEWEX likes to strengthen its collaboration with Future Earth beyond the strong cooperation with iLEAPS and include MAIRS, GLP and the Carbon Communities.

- How the current funding affects your community, your activities, your service
    - The reduced funding from 120 K a few years back to roughly 40K is not sustainable to support our core activities and engage the community in shaping WRP into community relevant dorections. This would require even more additional funding to be sought to support meetings and travel in particular to ECS and LDC participants. Given the current political climate in the US it is not clear how GEWEX can resolve that smoothly or without potential repercussions.
    - We are organizing the GEWEX OSC in 2018 that requires significant funding mostly external to WCRP. Yet WCRP contribution is essential and has been provided for which our gratitude.
    - The IGPO budget has been constant for the last 5 years and not clear how future US congressional budget decision might impact the IGPO. Increase is highly unlikely.
    - We are at if not beyond the limits of our capabilities given the current funding. Streamlining the many activities and the increased efficiency cannot keep up with the decreased funding