

Highlights from the Workshop on Lessons Learnt for Climate Change Research: IPCC AR5

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Group photo, 9th September 2014, ISSI courtyard (Courtesy of Saliba Saliba, ISSI)

The Joint Scientific Committee (JSC) of World Climate Research Programme (WCRP), working closely with Working Group I of the Intergovernmental Panel on Climate Change (IPCC), organized a meeting on the topic "Lessons Learnt for Climate Change Research" with respect to the recently published IPCC Fifth Assessment Report (AR5). In partnership with the Technical Support Unit of IPCC Working Group I and the International Space Science Institute (ISSI) on the campus of the University of Bern, and with substantial financial support from the Swiss Federal Office for the Environment, WCRP invited more than 75 climate researchers to revisit the AR5 – primarily Working Group I (Climate Change 2013 – The Physical Science Basis), but also Working Group II (Climate Change 2014: Impacts, Adaptation and Vulnerability) and Working Group III (Climate Change 2014: Mitigation of Climate Change). During three days of intense presentations and discussions the participants – a good mixture of lead authors of the IPCC AR5 and WCRP project leaders – evaluated climate science, WCRP directions and plans and future needs for research and assessments.

The Scientific Steering Committee for the meeting structured the topics and sessions around the issue of knowledge gaps where interesting and useful discussion emerged. The overall approach of AR5 of assigning explicit and calibrated uncertainty language to key findings of the report, either through specifying a qualitative level of confidence (e.g. "medium" or "low"

confidence if confidence is limited) or, if the science permits, a quantified likelihood that a certain finding is true, allowed the Scientific Steering Committee to easily extract and expose a series of Key Uncertainties in observations, forcing factors, fundamental understanding and global and regional projections. The participants were challenged to assess WCRP activities, particularly the WCRP Grand Challenge activities, in light of these uncertainties identified in the IPCC WGI AR5. Perhaps not surprisingly, the group found a good match between goals of the WCRP Grand Challenges – on clouds and atmospheric circulation, sea level rise, climate extremes, water availability, cryosphere and regional climate information – and knowledge gaps identified in the WGI AR5. In many cases this close overlap allowed various break-out groups to focus on details and implementation activities for the Grand Challenges with fresh ideas and new energy.

The cross-analysis of uncertainties versus ongoing activities exposed four areas where uncertainties are still substantial and which were not covered by, but definitely needed for progress within, the WCRP Grand Challenges. These included:

- The issue of ocean (particularly deep ocean) heating and ocean circulation generally (the former certainly identified within the sea level Grand Challenge and prominent within the pre-meeting survey, the latter linked to decadal prediction challenges), which seemed too weakly represented in the meeting agenda and perhaps in the Grand Challenges as well;
- The need for greater emphasis on understanding natural variability and forced change on annual to decadal time scales as relevant and indeed urgent for predictions of climate extremes (particularly those related to water availability) and other climate impacts on regional spatial scales;
- The need for better descriptions of and incorporation of aerosols (and other so-called short-lived climate forcings) into understanding and predicting on annual to decadal time scales and on local to regional spatial scales; and
- The growing need to incorporate interactive components of the carbon cycle, including terrestrial and oceanic geochemical and ecological sources and sinks, into analyses and models.

The goal of increased skill on decadal time scales emerged from several sub-groups into a more general theme, indicating a need for WCRP to promote and strengthen its Decadal Climate Prediction Project. Because nearly every speaker and every report emphasized their need for better and more systematic sources of and access to data, substantial interest developed in a proposed earth system reanalysis. Several people suggested that such an effort should build on the enormous impact of meteorological reanalyses through a very broad effort to gather and assimilate data products from across and beyond WCRP activities. Based also on numerous presentations, the assembled group recognized the extreme utility and persistent need for model inter-comparison projects (MIP) applied to many types of models while also raising fundamental concerns about limited computing resources (staff and hardware) available to support those efforts.

Recognizing the enormity and the quality of the AR5 process, the group discussed alternatives, including small topical assessments that might then represent components of a subsequent encompassing assessment. A collective motivation emerged to not simply repeat past steps and past processes, and to not accept CMIP6 outcomes without substantial, collective, perhaps even dramatic improvements over CMIP5 on many fronts and for many features. Based on explicit reminders of the relentless increase of carbon emissions and anticipation of an abrupt end to the so-called hiatus of global mean surface air temperature increases, a growing and increasingly urgent need for accurate, timely and accessible climate information was considered a very necessary step forward.

The full report can be downloaded from:

http://www.wcrp-climate.org/images/documents/reports_flyers/Bern%20workshop%20report.final.29.01.15.pdf