WCRP NEWS
World Climate Research Programme

WCRP-UNESCO Workshop on "Metrics and Methodologies of Estimation of Extreme Climate Events", 27-29 September 2010, Paris, France.

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The recent summer record- breaking flooding in Pakistan, India and China, and heat-waves and wildfires in Russia, highlight the need to be able to better predict extremes of the hydrological cycle and to know how they will evolve in a changing climate. WCRP has a major cross-cutting activity on extremes that involves all its projects and modelling groups. A workshop on metrics and methodologies of estimation of extreme climate events was held at UNESCO Headquarters in Paris, France, on 27-29 September 2010 (http://www.extremeworkshop.org/). Representatives from fields as diverse as meteorology, statistics and re-insurance came together to review and assess the existing means of observing and defining extreme climate events and discuss how these could be strengthened. The overarching objective of the workshop was to develop an optimal strategy to improve our ability to estimate the risk of climate extremes occurring in a changing climate.

Some 132 people from 32 countries attended the workshop, the organization of which was led by Dr. Olga Zolina of the University of Bonn and a member of the GEWEX SSG. Invited presentations were given on topics ranging from heat-waves to hurricanes. Poster sessions provided an opportunity for senior experts, students and early career scientists to discuss their work in more detail. Breakout groups were held on issues of 1) data requirements and availability (such as the need for hourly precipitation data to properly characterize extremes); 2) representation of extremes in models, including scaling and spatial issues (how station data relate to grid squares, comparing apples to apples); and 3) methodologies for estimating extremes across areas and disciplines, including statistical methods. Other issues raised included the need to have estimates of vulnerability and exposure as well as probabilities of climate extremes in order to calculate risk and provide useful information to decision makers and how to best communicate with the non- experts on technical attribution issues.

Presentations at the workshop pointed to the likelihood that the southeast Asian floods and the Russian drought this summer were linked by the monsoonal circulation and teleconnections associated with the anomalous latent heating of the atmosphere associated with the heavy rains. The case was made that the pattern of the rains was related to the rapidly developing La Niña but the previous El Niño had left behind a residue of abnormally high sea surface temperatures in the Indonesian-northern Indian Ocean region that provided an enhanced supply of moisture to the monsoon rains. Those elevated temperatures were thought to almost certainly have a global warming component and the persistent "blocking high" over Russia led to drought that was probably more intense and longer lasting owing to global warming, with increased risk of heat waves and wild fires. While these connections are very likely, they are hard to prove as models do not reproduce monsoon rains very well, and blocking is poorly simulated. Hence there is a need to better understand the basic processes causing extremes and to be able to better model them. Thus the scientific challenges associated with extremes extend across the WCRP.

Workshop participants agreed that their common goal was to provide much improved observational datasets and model capabilities on variability and extremes, especially those that

have high impacts on society and the environment; and develop a climate information system that include predictions and assessments of future changes in risk from extremes.

Some proposed activities include:

- Develop improved high temporal resolution (sub-daily) datasets that can be used to assess changes in extremes of all sorts, including especially those with high impacts on humans and the environment, such as drought, heat waves, floods, and storms. As well as obtaining and recovering data, this activity will require reprocessing and homogenizing the data into climate data records.
- Promote sustained observing systems to allow predictions of seasonal to decadal time scales.
- Provide a focus for evaluating models with regard to how well they replicate extremes, including developing better methods for comparing model grid point values with observations.
- Determine the main phenomena responsible for extremes, such as blocking anticyclones, tropical storms, tornadoes, polar lows, and snow storms, and evaluate models from the standpoint of their ability to reproduce statistics of these, and how they vary and change.
- Improve understanding of the relevant physical processes and ways to improve them in models.
- Develop robust statistical methods for assessing extremes and their uncertainties and make tools available for wide-spread use.
- Ensure that archives of model projections include sufficient high frequency data to assess pdfs and extremes.
- Develop a CMIP5 focused activity on analysis of extremes.
- Build a community of climate scientists and statisticians working together
- Implement creative ways to improve data sharing

A white paper is being prepared to develop more detailed recommendations for action based on the workshop discussions.