

Temperature and Precipitation Extremes Working Group

Prepared by Richard Grotjahn, University of California-Davis

Extremes have large societal and economic consequences, are not yet well understood, and comprise a wide range of scales and physical mechanisms. Also not clear is how realistic are model representations and related future projections of extremes. A working group (WG) has been formed to consider temperature and precipitation extremes, with a narrow focus on those extremes affecting North America that are associated with large scale meteorological patterns (LSMPs) and which occur over 5 days or less. The WG will focus on temperature extremes (both hot spells and cold air outbreaks) and precipitation extremes (excluding those caused directly due to tropical cyclones landfall). A few studies have shown that extreme events are associated with LSMPs that have a spatial scale bigger than mesoscale systems but smaller than the near-global scale of some modes of climate variability. The LSMPs, which can include specific synoptic structures like: large scale wavetrains, blocking-like ridges, atmospheric rivers, and intense frontal system features, are distinct from named climate modes (such as the NAO) though such modes may influence the LSMP. Exploiting a link between LSMPs and rare extreme events that may occur on a smaller space and time scale, provides a tool to study climate model simulations of extremes in a changing climate. There are several knowledge gaps including: how LSMPs vary for different geographic regions, the interaction between LSMP and local topography, how LSMPs vary with season, how the LSMPs form, how well global models create LSMPs, how well the LSMP must be simulated to adequately downscale the event, and whether model physics are adequately designed to reproduce extreme events. Now is an opportune time to examine these critical issues since there is now sufficient preliminary work and data (e.g. CMIP5 data) to make the proposed effort reasonable.

The WG membership was finalized in late April with 2 co-chairs, 12 core members, 2 international and 1 US contributing members. The WG held teleconferences in May and early June. A WG web page was created by the US CLIVAR office, and a wiki has been set up for sharing information and developing documents.

Current plans are for the WG to:

- Prepare two survey papers, one on precipitation extremes and the other on temperature extremes, both topics narrowed to fall within the scope of the WG. The twin goals are to summarize current knowledge as well as identify gaps in understanding.
- Organize a workshop (summer of 2013) to bring together expertise in dynamics, modeling, and extreme statistics on LSMPs and related extreme events.
- Prepare a post-workshop document summarizing tools for evaluating climate model simulations of extremes within the LSMP context and preliminary application of such tools.