

WCRP statement supporting the WCRP's corresponding poster presentation to the Ninth Meeting of the Research Dialogue (RD 9) of UNFCCC SBSTA-46, Bonn, Germany, 10 May 2017

Theme 1: Regional climate research data and information, and gaps

WCRP Grand Challenge on Understanding and Predicting Weather and Climate Extremes

L. Alexander, G. Hegerl, S. Seneviratne, X. Zhang and the GC-Extremes team

The WCRP Grand Challenges are designed and implemented to confront urgent challenges in climate science, with coordinated efforts among the scientists within and beyond the WCRP community.

The main objective of the WCRP Grand Challenge on Understanding and Predicting Weather and Climate Extremes (“GC-Extremes”, www.wcrp-climate.org/grand-challenges/gc-extreme-events) is to better identify the factors and mechanisms that determine the location, intensity, and frequency of various climate extremes. For such information, our society depends increasingly upon the global climate research community; in the near-term (from a season to a year) to mitigate risks to society and ecosystems, and in the longer term (from a decade to centuries) for effective adaptation planning.

In order to best progress towards the above goal, the GC-Extremes exhibits four overarching themes:

- Document: Are existing observations sufficient to underpin the assessment of extremes?
- Understand: What are the relative roles of large-scale, regional and local processes, as well as their interactions, for the formation of extremes?
- Simulate: are models able to reliably simulate extremes and their changes, and how can this be evaluated and improved?
- Attribute: What are the contributors to observed extreme events and to changes in the frequency and intensity of the observed extremes?

These four themes are carefully designed to overlap and are closely linked with each other. A particular focus should lie on providing “actionable information” as to facilitate science progress and overcome long-standing barriers – like, for example, data availability issues, understanding regional-scale feedbacks, attributing changes in both risk of regional extreme events as well as in large-scale frequency and intensity, and

World Climate Research Programme

WCRP statement supporting the WCRP's corresponding poster presentation to the Ninth Meeting of the Research Dialogue (RD 9) of UNFCCC SBSTA-46, Bonn, Germany, 10 May 2017

developing more effective methods to evaluate extremes in climate models. Progress on these topics is increasingly enabled by cross-disciplinary scientific advances. Strong engagement of the wider research community is essential to spark the public's interest in research on climate extremes.

The GC-Extremes' implementation strategy focuses on four core categories of extreme events: heatwaves, droughts, heavy precipitation and storms, with other event types benefitting indirectly.

The GC-Extremes is advancing its science agenda through several activities:

- Engaging with scientists across disciplines to facilitate additional progress. One example is involving scientists working on long-term climate change and changes in statistics of extremes with weather scientists who focus on individual events and storylines. The GC-Extremes is currently drafting a review paper presenting potential key avenues for research on changes of extreme events.
- Focused workshops on key topics that impede progress. This includes, for example, a recent workshop on compound events to better address, both statistically and meteorologically, multi-variate heat waves.
- Engaging the wider scientific community. Corresponding examples are presentations to regional and countrywide research groups, as well as involving the paleoclimate community in considering extreme events from a paleoclimate perspective, building on long-term documentary records and proxies.
- Emphasizing the need for research to funding agencies.

Overall, the GC-Extremes' activities link diverse communities around a highly relevant topic with significant potential for progress through jointly coordinated activities.