Environment Canada Environnement Canada

Canada

WCRP Grand Challenge Climate Extremes

Lisa Alexander, Xuebin Zhang, Gabi Hegerl, Sonia Seneviratne

GC Climate Extremes

Led by GEWEX, in consultation with CLIVAR

White paper:

David Karoly, first draft;

X. Zhang, G. Hegerl, S. Seneviratne, R. Stewart, F. Zwiers, L. Alexander, (Final draft, Feb 2014)

Implementation plan (December 2014): L. Alexander, X. Zhang, G. Hegerl, S. Seneviratne

GC Climate Extremes

Understanding and predicting weather and climate extremes

Status:

Final white paper posted February 2014

First version of implementation plan is being completed

White paper: 8 key questions

1: improved quality of ground-based and remote-sensing based datasets for extremes *(GEWEX: GHP and GDAP)*

2: improved models for simulations of extremes *(WCRP wide theme)*

3: interactions between large-scale drivers and regional-scale land surface feedbacks affecting extremes *(GEWEX: GLASS)*

4: role of external (e.g. anthropogenic) forcings vs internal variability for changes in intensity and frequency of extremes *(ETCCDI/IDAG/CLIVAR)*

White paper: 8 key questions

5: factors contributing to the risk of a particular observed event *(ACE/ETCCDI/IDAG/CLIVAR)*

6: causes of drought changes in past and future *(GDIS/GEWEX/CLIVAR)*

7: predictability of changes in frequency and intensity of extremes at seasonal to decadal time scales *(WGSIP/CLIVAR/GEWEX)*

8: role of large-scale phenomena (monsoons, modes of variability) for past and future changes in extremes *(CLIVAR/GEWEX Monsoon panel)*

White paper: 8 key questions

1: impro…ased datasets

2: impro…*le theme)*

3: interactions between large-scale drivers and regional-scale land surface feedbacks affecting extremes *(GEWEX: GLASS)*

4: role of external (e.g. anthropogenic) forcings vs internal variability for changes in intensity and frequency of extremes *(ETCCDI/IDAG/CLIVAR)*

5: factors contributing to the risk of a particular observed event *(ACE/ETCCDI/IDAG/CLIVAR)*

6: cau… *(GDIS…*

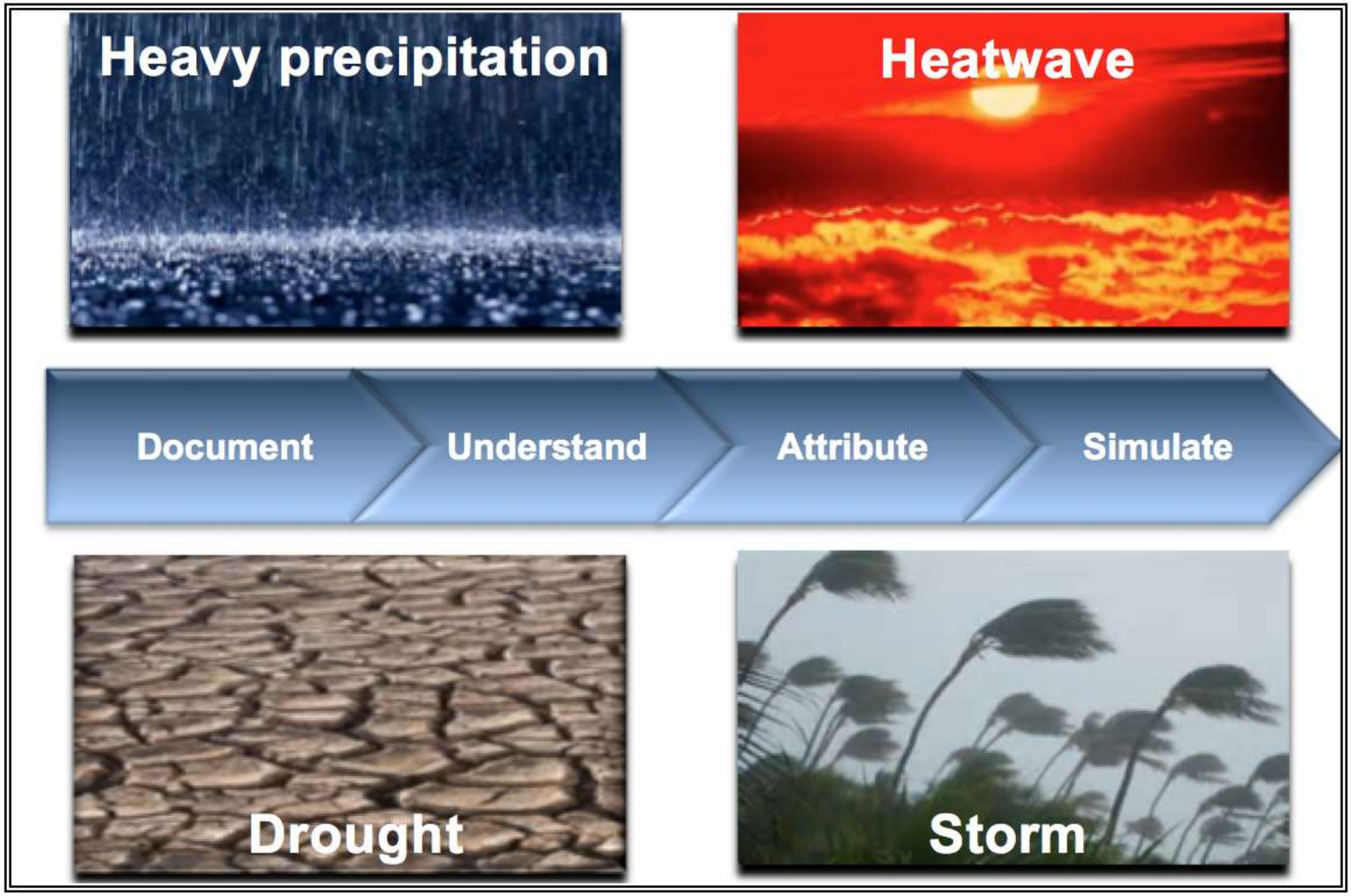
7: predictability of changes in frequency and intensity of extremes at seasonal to decadal time scales *(WGSIP/CLIVAR/GEWEX)*

8: role of large-scale phenomena (monsoons, modes of variability) for

Implementation plan requires focus on selected themes/topics

Other 4 topics are covered by on-going activities / established communities

4 main extremes, 4 over arching themes



Implementation plan: 4 themes

improved quality of ground-based and remote-sensing based datasets for extremes

DOCUMENT

interactions between large-scale drivers and regional-scale land surface feedbacks affecting

UNDERSTAND

role of external (e.g. anthropogenic) forcings vs internal variability for changes in intensity and frequency of extremes

ATTRIBUTE

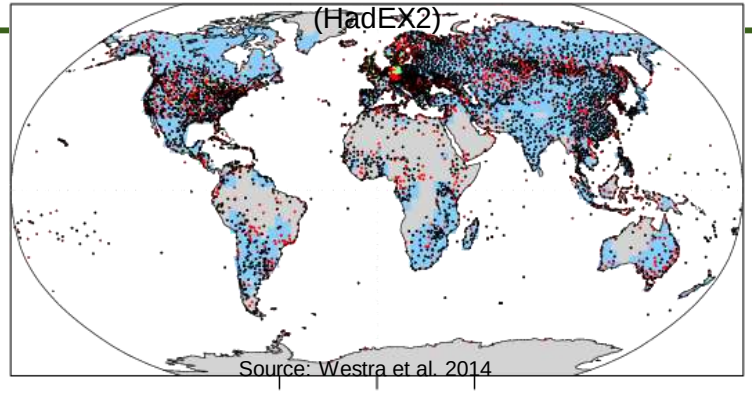
Evaluate and improve models for simulations of extremes

SIMULATE/PREDICT

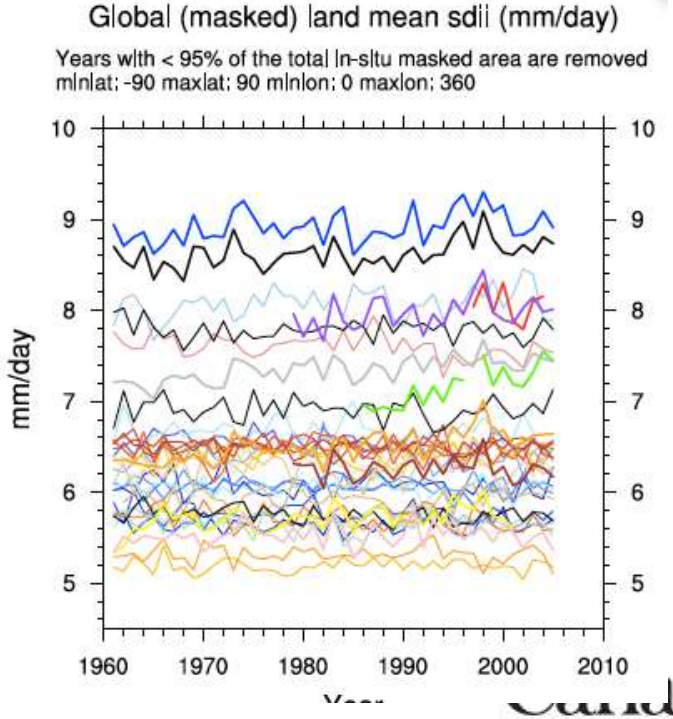
Document

Observations provide crucial underpinning but are often not well-constrained and critical gaps exist in the amount, quality, consistency and availability, especially with respect to extremes

Sub-daily precip stations (HadISD) and SDII coverage (HadEX2)

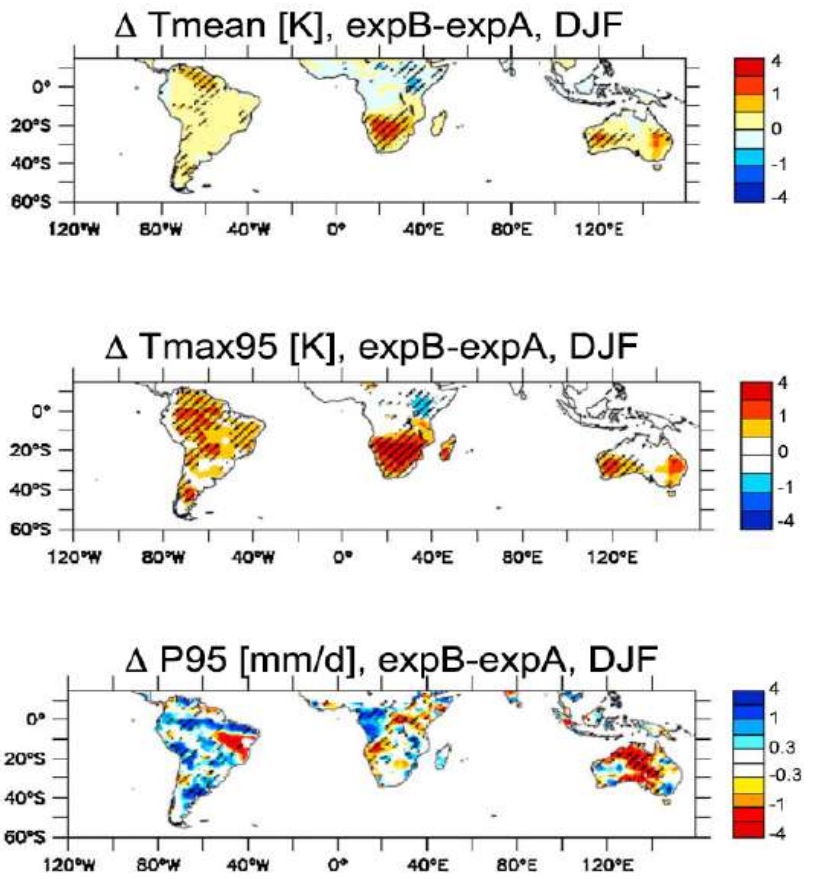


Source: Westra et al. 2014



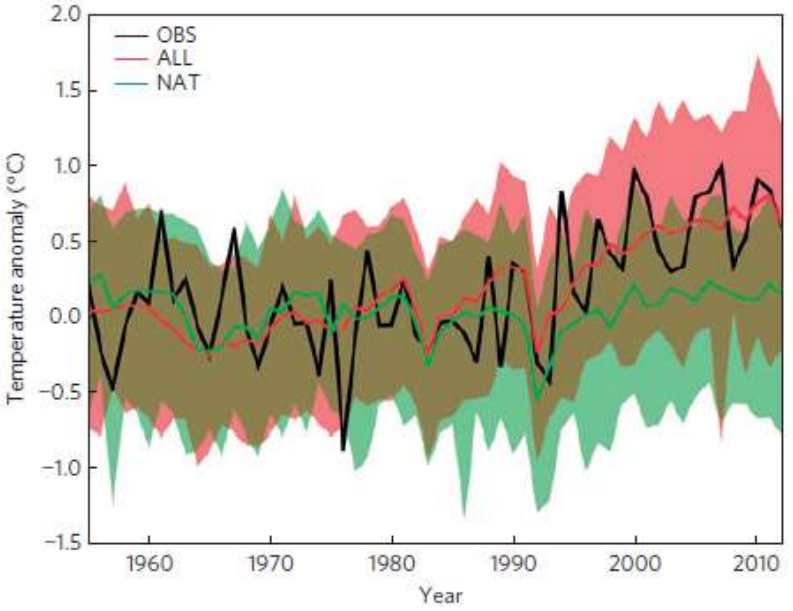
Understand

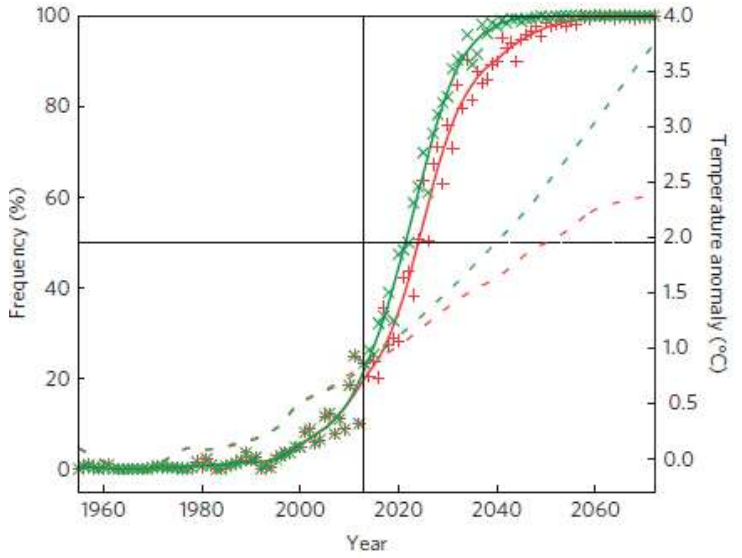
Interaction between large-scale phenomena (weather types, modes of variability) and regional-scale land-atmosphere feedbacks or forcings can be critical



Attribute

A key challenge is to understand the extent to which humans are responsible for changes in extremes and particularly the likelihood of individual extreme weather events

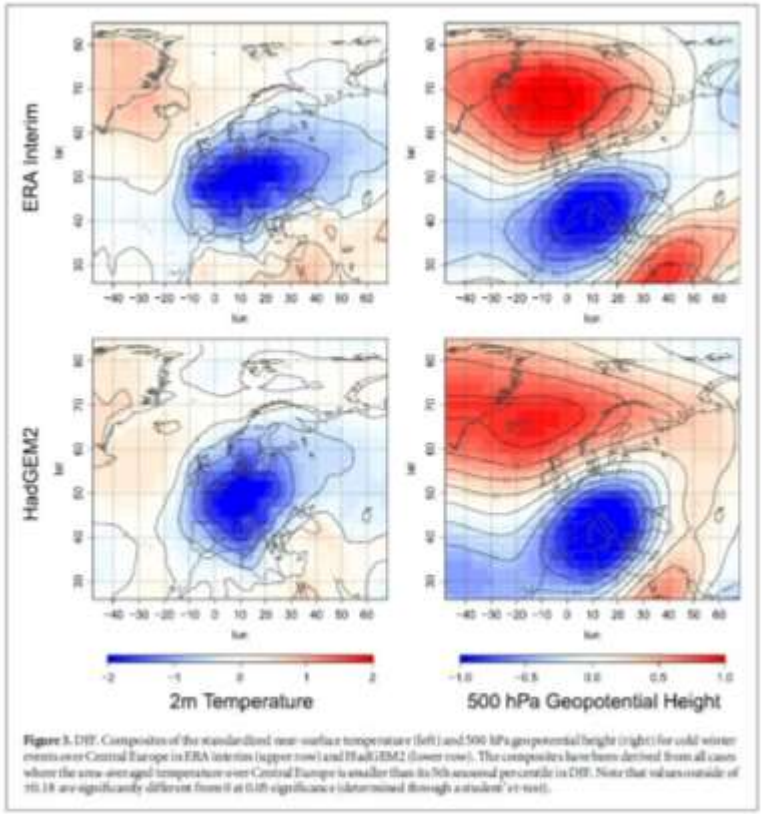




Sun et al. 2014

Simulate

To understand the types of events that current GCMs and RCMs can provide credible and robust simulations for and to identify key processes for weather and climate extremes that can be credibly simulated to improve prediction



Source: Krueger et al. 2015

A 2-pronged approach

- Coordination needs across and between existing activities
  - Who is already doing what
  - Enabling existing projects, avoiding duplication

- What new activities, research or data gathering needs to be undertaken?

Leads

Lisa Alexander

Ali Behrangi

Gabi Hegerl

Erich Fischer

Jana Sillmann

Document → Understand → Attribute → Simulate

Sonia Seneviratne

Olivia Martius

Robert Vautard

Xuebin Zhang

Fredi Otto