Grand Challenge on
Weather and Climate Extremes

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WCRP grand challenge on weather and climate extremes

- ***service perspective***: What are frequency and magnitudes of various impact-causing extremes in the near and long term?
- ***science perspective***: causes and mechanisms of variability and change in extremes, how to improve the prediction of change
- Essential link to users

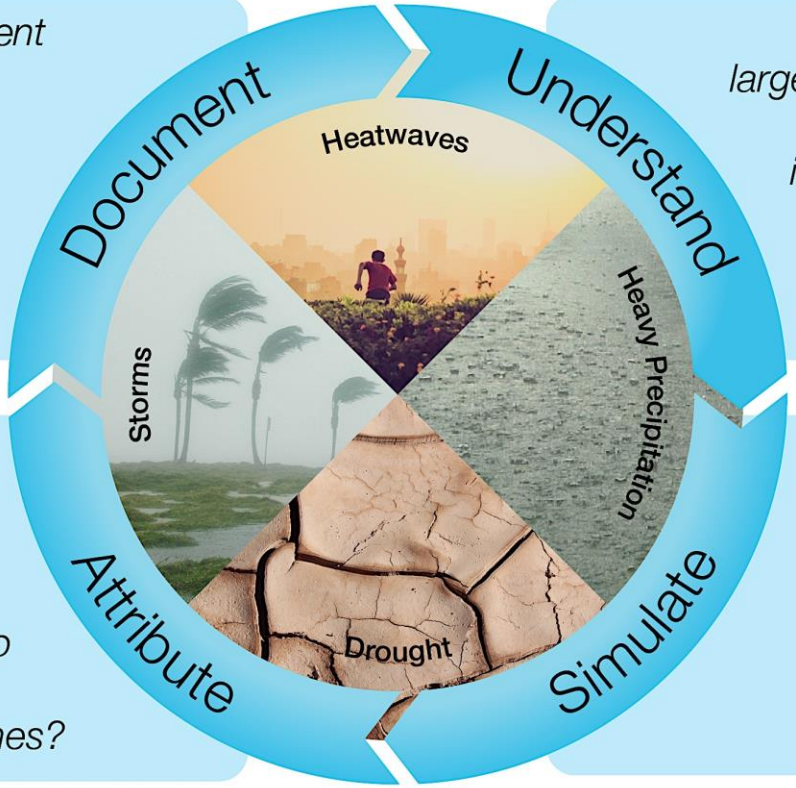
WCRP grand challenge on

weather and climate extremes

4 main extremes, 4 overarching themes

Are existing observations sufficient to underpin the assessment of extremes?

What are the relative roles of large-scale, regional and local scale processes, as well as their interactions, for the formation of extremes?



What are the contributors to observed extreme events and to changes in the frequency and intensity of the observed extremes?

Are models able to reliably simulate extremes and their changes, and how can this be evaluated and improved?

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GC-Extremes

Highlights for JSC

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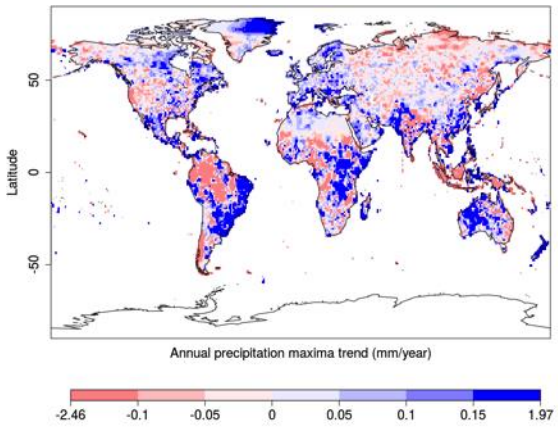
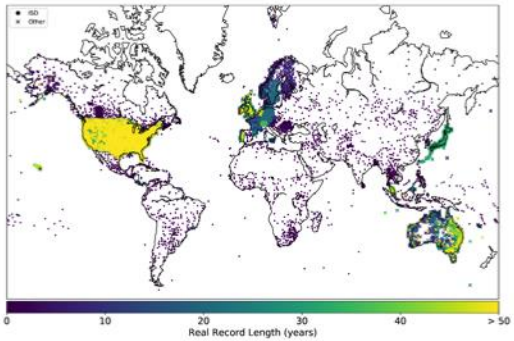
Update on Data Activities

- ***Joint workshop with GEWEX Data Assessment Panel (GDAP)*** Jul 2018
  - Focus on International Precipitation Working Group (IPWG) global precipitation assessment contribution on extremes
  - Guidance and best practice documents
  - Coordination for IPCC AR6 especially re remote sensing
- **New/updated datasets**
  - 'HadEX3' planned by end 2018/early 2019
  - Daily global land 1º x 1º gridded precip 1950 onwards almost complete
  - INTENSE - sub-daily precipitation indices



INTENSE > 25000 stations so far



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Compound Events

(outcome from workshop, Zurich, April 2017)

GEWEX

Workshop on Addressing the Challenge of Compound Events

ETH Zurich, Switzerland
19–21 April 2017

Jakob Zscheischler[1], Seth Westra[2], Bart van den Hurk[3], Philip Ward[4], Andy Pitman[5] and Sonia I. Seneviratne[1]

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What is a compound event to you?

(Zscheischler et al., submitted)

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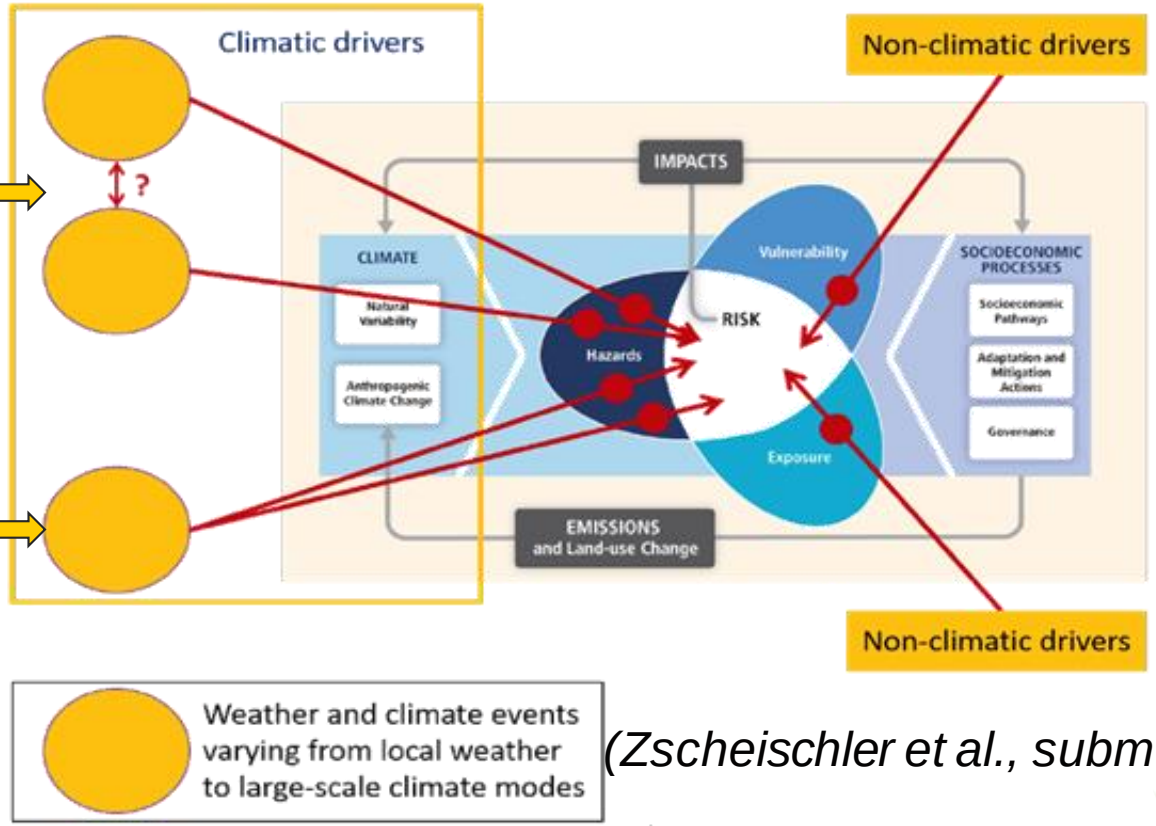
Compound Events

(outcome from workshop, Zurich, April 2017)

Multiple drivers contributing to single hazard

Single driver causing multiple-hazards



(Zscheischler et al., submitted)

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Compound Events

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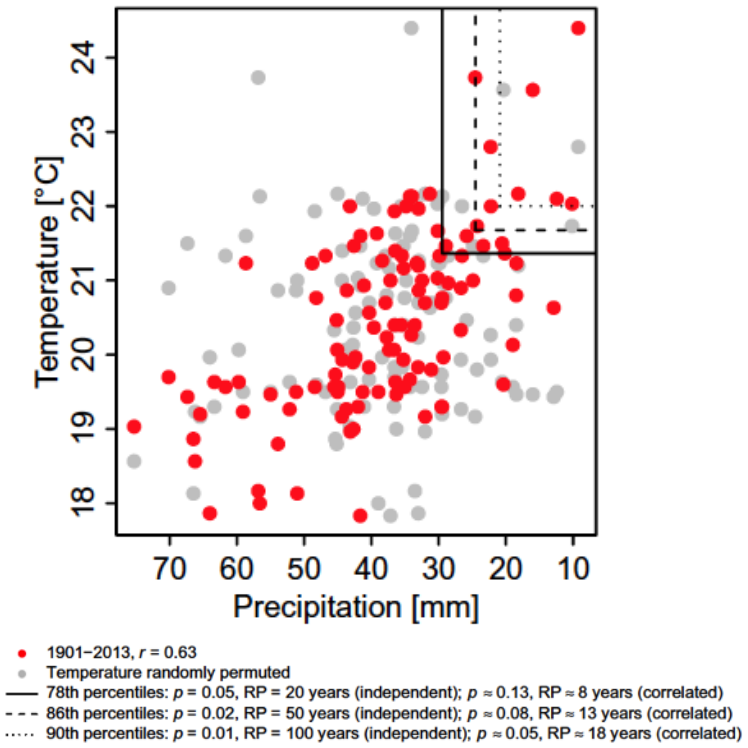

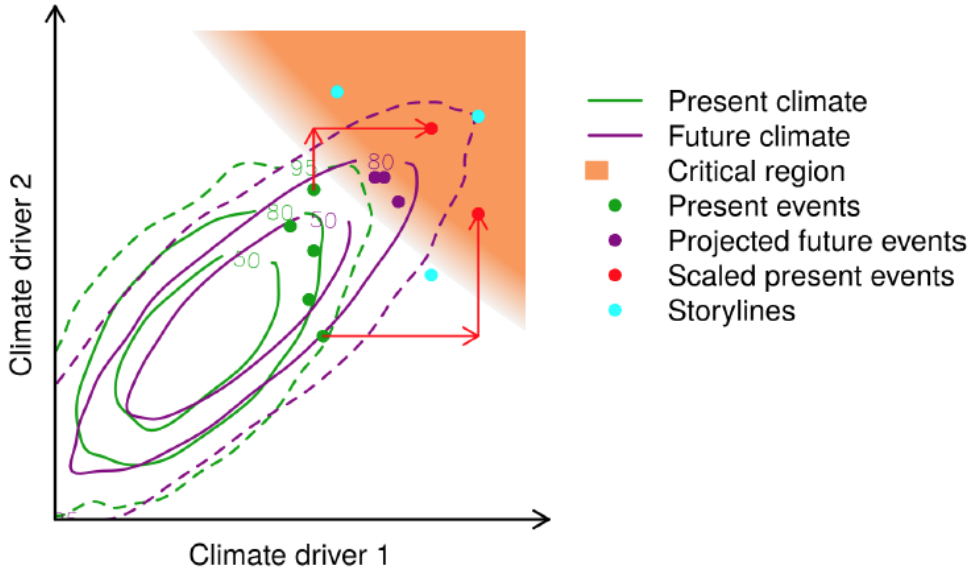

(Zscheischler et al., submitted)

Zscheischler and Seneviratne, Science Advances)

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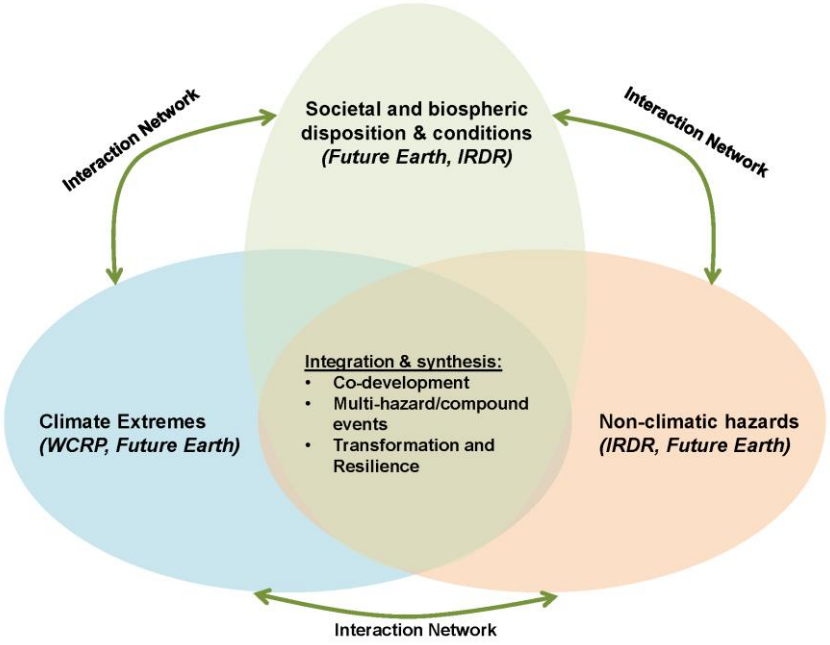
GC-Extremes

Knowledge Action Network on Emergent Risks and Extreme Events (RISK-KAN)

- Supported by ICSU
- Three partners: Future Earth, Integrated Research on Disaster Risk (IRDR), WCRP
- global network of interdisciplinary science excellence
- Solution oriented research for disaster risk reduction under global environmental and societal change
- Jointly identifies priorities on research in systemic risk and interaction between climate change-related and other disasters



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Knowledge Action Network on Emergent Risks and Extreme Events (RISK-KAN)

WCRP's role so far

- Scoping and vision development

Benefits for WCRP

- Direct collaboration with Future Earth and IRDR
- Interaction/two-way communication with users/stakeholders
- Exciting new research questions and applications for climate sciences

Current status

- Scoping workshop (Nov. 2017, Tokyo), RISK-KAN is an open network
- Open call for members of Development Team (April 2018)
- Risk KAN side event at the GEWEX OSC (May 2018, Canmore)
- To meet in Paris to to establish Development Team and to define ToR etc. (June 2018)

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Institute of Advanced Studies in Climate Extremes and Risk Management

(Direct Contribution to New WCRP SP/IP)

- WCRP contribution to RISK-KAN
- Aiming at improving communications between WGI and WGII communities
- 30 students (senior PhD/Post-doc) + 10 lecturers from both WGs
- Involve Future Earth and IRDR
- **NUIST WMO Training center, Fall 2019**
- partial funding (c.a. ¥450kRMB) from NUIST approved
- **Need JSC approval/endorsement**

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GEWEX OSC, May 2018

- Large gathering, multiple sessions on all four themes (160+ abstracts on extremes alone)
- Side meetings on Compound Events and on RISK KAN
- Coordinated meeting with WWRP

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Contributions to IPCC AR6 Assessment

- GC-leads are among CLAs (3), LAs (3) and RE (1) for various chapters
- IPCC Expert Meeting on Assessing Climate Information for Regions, May 2018, Trieste, Italy
- Workshops to coordinate contribution [e.g. Offenbach meeting in July]

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Looking Forward

GC-Extremes

- Some science advances
  - high resolution / convection permitting modelling
  - physical understanding and modelling:
    - increase in the intensity of the strongest tropical cyclones;
    - Intensify heavy rainfall associated with tropical cyclones (a human influence has been suggested, e.g., for Harvey rainfalls)
    - Exacerbate impact of storm surges due to sea level raise (eg Hurricane Sandy)
- Extremes continue in the headlines and raise new research questions
  - Recent intense fire seasons, very active TC season and heat waves/droughts
  - event attribution science developing strongly and being important; needs to connect to adaptation research
- Main themes and main questions of the GC remain

GC-Extremes

- **Learning from users and addressing their needs**
  - Addition of compound events (New SP/IP)
  - RISK-KAN (New SP/IP)
  - Institute of Advanced Studies in Climate Extremes and Risk Management (New SP/IP, NUIST Fall 2019)
  - Development of guidance document on future projection of extremes to be released after the conclusion of IPCC WGI AR6 report (New SP/IP)

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Challenges

- Everyone is doing “extremes”
  - how to coordinate across programs and projects
- Closure of ETCCDI by WMO/CCl
  - **Climate change research within WCRP (avoiding overlap and inconsistent approaches and gaining strength from a combined approach)**
  - Coordination with WMO on application of WCRP science
- Recommend to REPLACE ETCCDI and EXPAND its scope with a standing committee on extremes
  - Coordination among all programs/projects
  - A gateway to users
  - Need a suitable home under WCRP’s new structure

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Challenges

- Funding issues
  - Most activities funded/supported outside of WCRP with strings attached
  - How to engage wider community (Is a core + open-network a model to go?)
  - How to engage scientist in developing world (funding + capacity issue)
- WCRP umbrella for Extremes-GC both financially and programmatically essential to continue this community-wide effort


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