

WMO/WGSIP INITIATIVE: “Risk of extremes”

An international project aimed at quantifying the risks of extreme events

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Context – Main goals

Extreme weather and climate events have huge impacts on society, and are becoming more intense and frequent as climate changes. Historical observations provide just one realisation of what could occur in a chaotic system, and may not represent current conditions in a changing climate. This makes it difficult to quantify the risks of extremes, especially for unprecedented events, and to understand their causes. However, simulations from state-of-the-art climate models that have been initialised with observations provide many more samples of climate variability, including events that have not yet occurred but that are dynamically possible. This project will therefore use the recently-developed UNSEEN method (UNprecedented Simulated Extremes using ENsembles, Thompson et al 2017, 2018, Kent et al 2017) to quantify the risks of extremes for a range of phenomena, over different regions and timescales, using large ensembles of initialised climate model simulations. The dynamical conditions leading to extremes will also be explored, and the capability of predicting individual events will be assessed. This project will exploit the CHFP and S2S databases, as well as other sources including ESGF and C3S.

This project links to the WCRP Grand Challenge on Extremes and addresses objectives 1 (Fundamental understanding of the climate system) and 2 (Prediction of the near-term evolution of the climate system) of the WCRP Strategic Plan.

Expected outcomes

- a series of case studies applying the UNSEEN methodology to a variety of phenomena and regions, potentially including compound events
- assessment of current capability of climate models to predict extreme events

Related initiatives and contact points

WCRP Grand Challenge on Weather and Climate Extremes
US CLIVAR Large Ensemble Working Group

References

Kent C., E. Pope, V. Thompson, K. Lewis, A.A. Scaife and N. Dunstone, 2017, Using climate model simulations to assess the current climate risk to maize production, *Environ. Res. Lett.*, 12, 054012.

Thompson, V., N. J. Dunstone, A. A. Scaife, D. M. Smith, J. M. Slingo, S. Brown and S. E. Belcher, 2017, High risk of unprecedented UK rainfall in the current climate, *Nature Comms*, doi:10.1038/s41467-017-00275-3

Thompson, V., N. J. Dunstone, A. A. Scaife, D. M. Smith, S. C. Hardiman, H-L. Ren, B. Lu and S. E. Belcher, 2018, Risk and dynamics of unprecedented hot months in South East China, *Climate Dynamics*, doi:10.1007/s00382-018-4281-5