

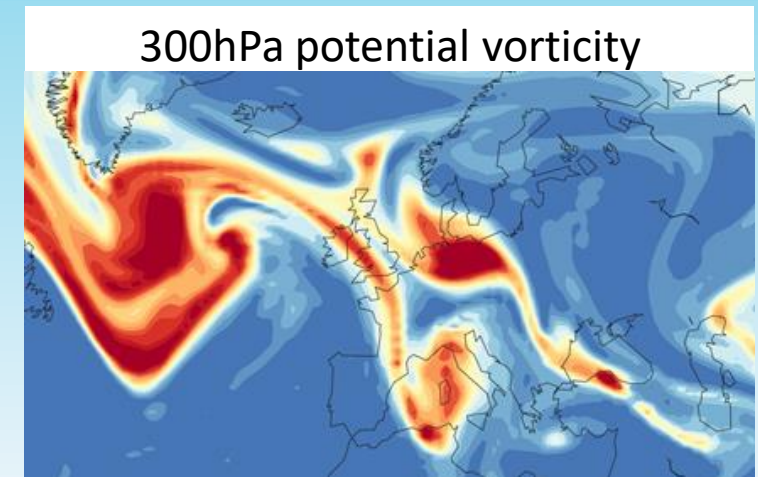
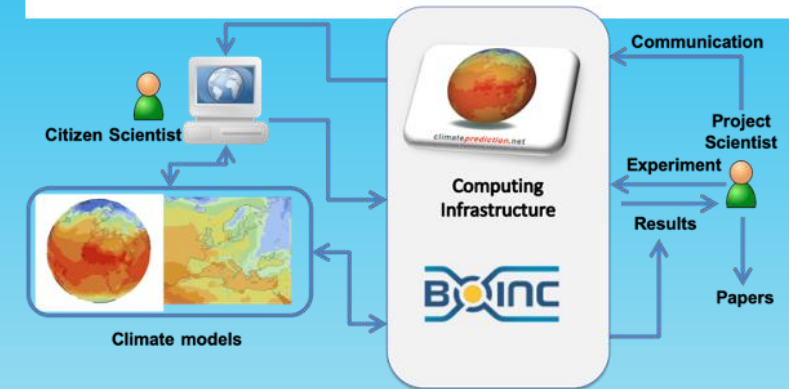
Understanding extreme events with multi-thousand member, high-resolution, global atmospheric simulations

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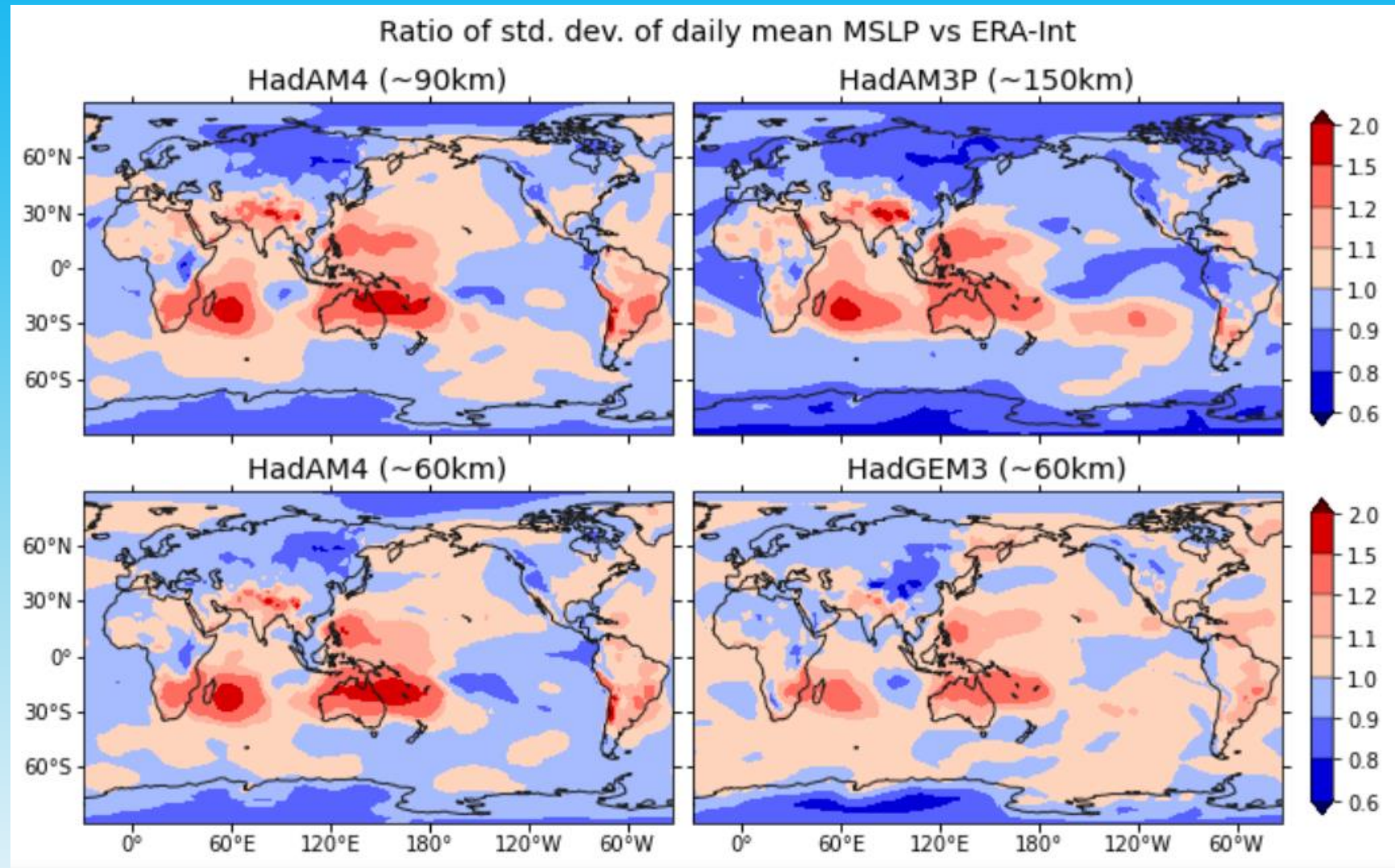
Large ensembles with distributed computing

- Implemented versions of a global atmospheric model (Met Office's HadAM4) with ~60km and ~90km grid spacing in the *climateprediction.net* distributed computing platform.
- Can produce multi-thousand member simulation datasets (of ~1 season to a few years in length).
- Allows study of extremes, parameter sensitivity, sensitivity to forcings etc.



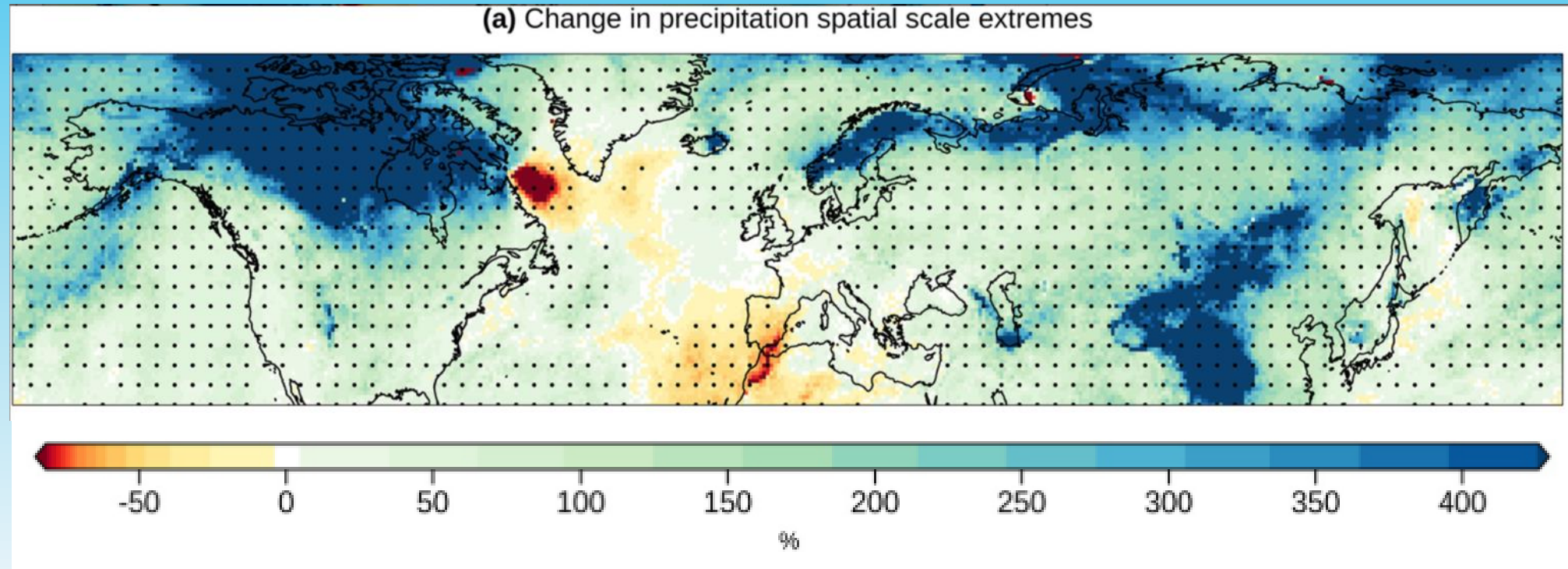
DJF dynamical variability improved

- DJF MSLP variance much better in new configurations (left) than in prior 150km model (top right).
- 60km configuration performs similarly to state-of-art HadGEM3 (bottom right).



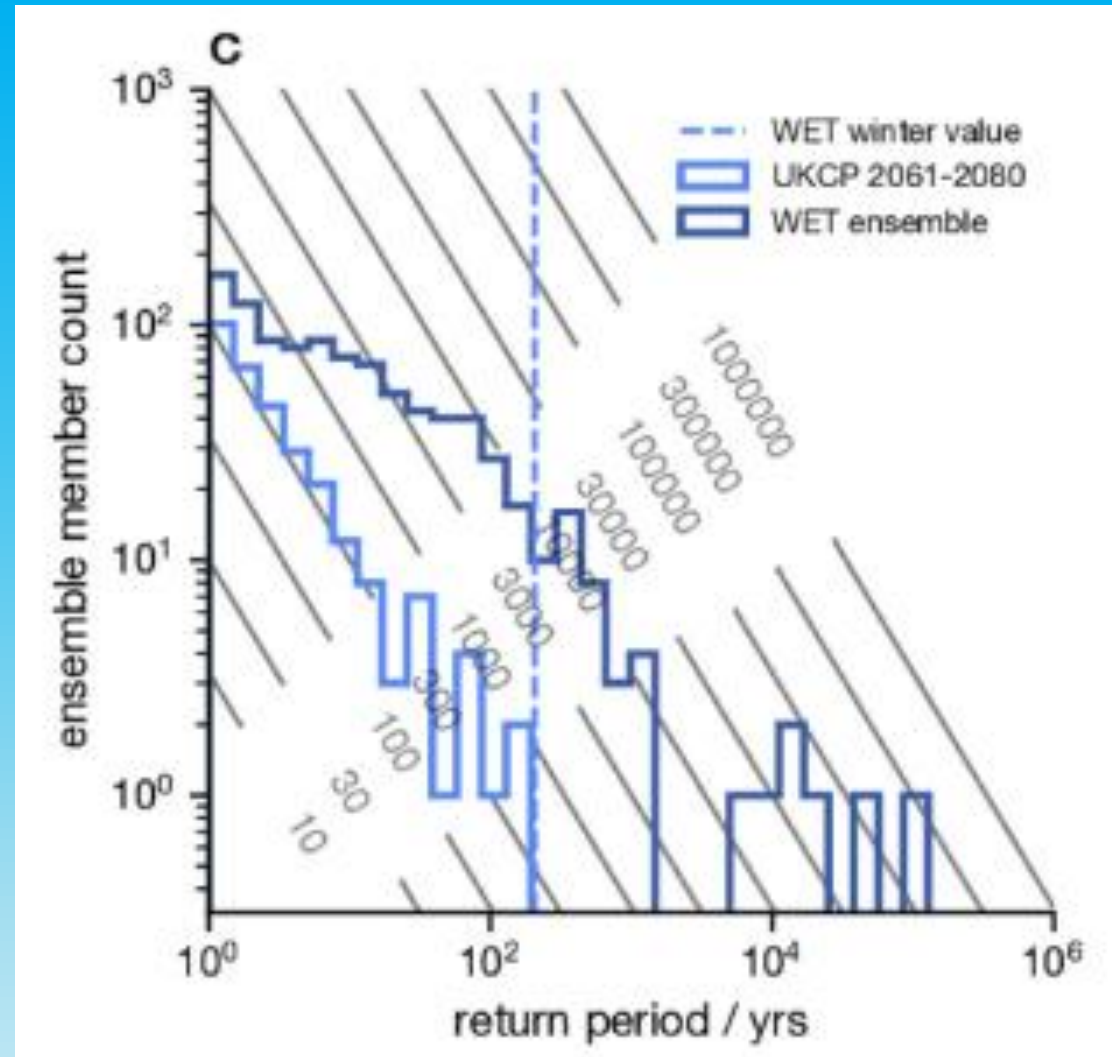
Increasing spatial footprint of winter precipitation (Bevacqua et al., 2021)

- ~1400 member 60km ensembles produced for historical and 1.5K and 2K warmer worlds.
- Spatial scale of extreme rainfall events found to increase in NH.



“ExSamples” project (Leach et al., 2022)

- ~1000 member 60km ensembles produced for each of a selection of winters in Met Office future projections.
- Winters selected to give better chance of getting many extremes.
- Allows study of impacts across wide sample of extreme events.
- Potential future extension of projects like the UK Climate Projections.



Histograms of numbers of members with UK-mean DJF rainfall at given estimated return level

Summary

- Capability developed to do multi-thousand member ensemble global atmospheric simulations at up to 60km resolution.
- Achieves state-of-the-art representation of winter extratropical variability.
- Results have included:
 - Showing that spatial scale of NH winter precipitation extremes is increasing (Bevacqua et al., 2021).
 - Large ensembles generated based on Met Office climate projections (Leach et al., 2022).
- Ongoing work on extreme events related to impact of Arctic ice loss, atmospheric rivers, heating and power demand, and methods development.
- Contact us if you have more ideas for how to use the data!