

Extremes

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5 questions

1. Which are the most appropriate methods to use to define and estimate weather and climate extremes?
2. How are changes in extreme events related to changes in the bulk of the distribution?
3. What can ensembles of imperfect models tell us about real-world extreme events?
4. Should we recalibrate model simulated extremes, and if so, how?
5. How predictable are weather and climate extremes?

1. Methods

- Indices \rightarrow dependent on thresholds/bias, mix between frequency/intensity
- Plea for statistical model of data generating process (GEV/GPD/PP) \rightarrow 3 parameters (location, scale, shape)

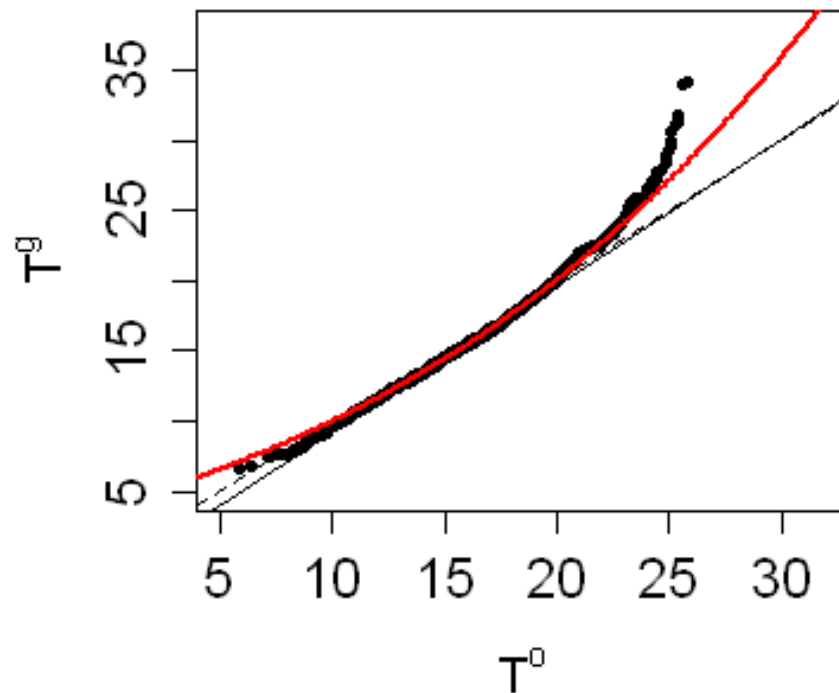
2. Changes in extreme events

- Sensitive to changes in scale and in shape
- Decomposition $\Delta T^{90} = f(\Delta T^{50}, \Delta \text{var})$
- Plea for analysis of changes in variance!

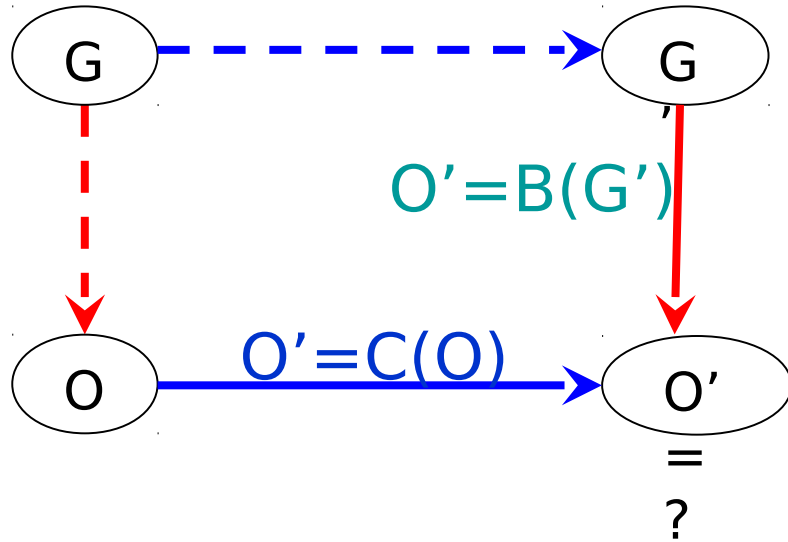
- Impact-rich events often result of nasty combination of factors
- Question: do correlated features remain correlated in the tails? \rightarrow process understanding required

3. Ensembles of models

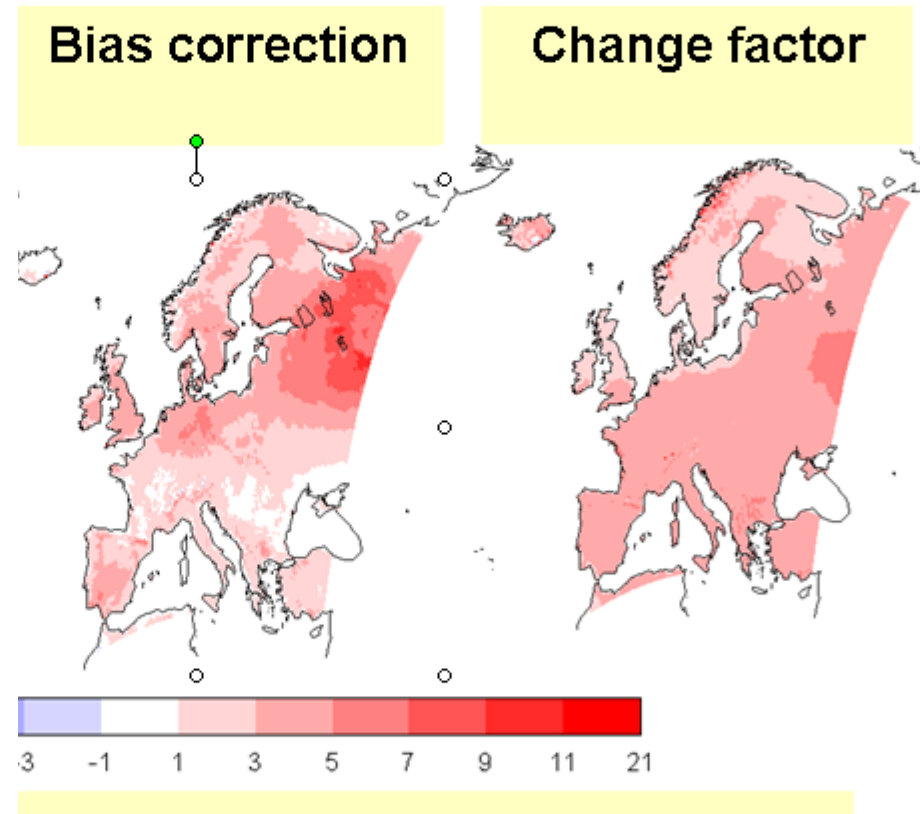
- Models can create large ensembles of realizations of the “climate”
- But: Model bias = (unknown) $f(\text{quantile})$



4. Recalibration of models



Ho CK, Stephenson DB, Collins M, Ferro CAT, Brown SJ. (2012)
Calibration strategies: a source of additional uncertainty in climate change projections, *Bulletin of the American Meteorological Society*, volume 93, pages 21-26.



5. Predictability

- Conditional skill > overall skill (but sample size limited)
- Select conditions leading to relevant extremes from forecast archive → case studies of forecast rather than observed extremes
- ∇ $\Delta\sigma^2 \rightarrow \Delta(\text{potential})$ predictability
- Window of opportunity: S/N extremes > mean?

What's in it for SPECS/EUPORIAS/

...

- Evaluate bias correction
- Analyse Δvar
- Assess conditional skill from (sub)set of forecasts
- Link skill to process understanding