Risks Associated with Stabilization Scenarios?

Uncertainty in Regional and Global Climate Change

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- Confidence and uncertainty in climate predictions.
- Grand ensembles and the climate*prediction*.net experiment.
- Climate sensitivity.
- Conclusions.

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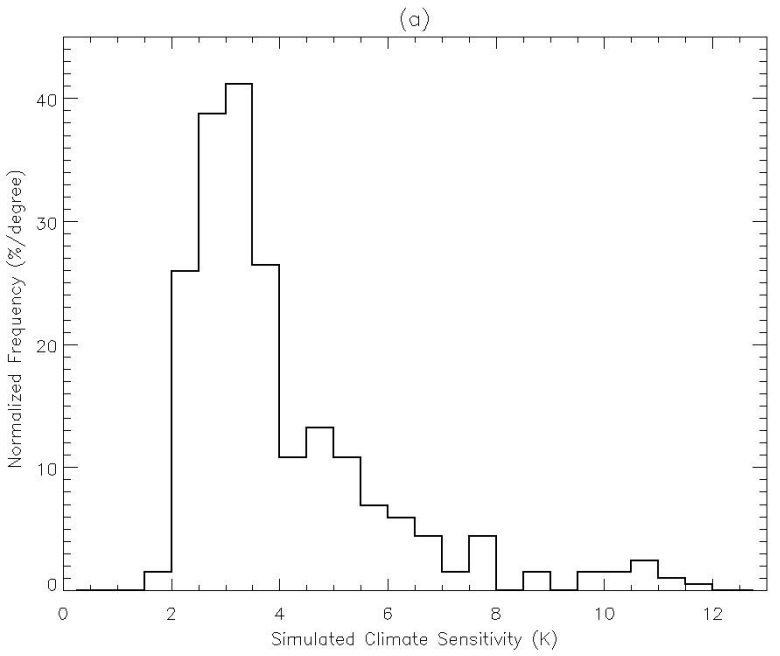
Confidence and Uncertainty

- Confidence and uncertainty - two sides of the same coin. An uncertainty range of 1.9-11.5°C is a confidence that it isn't under 1.9.
- Risk information is critical for adaptation and development.
- Predictions need uncertainty bounds which can be used in risk analyses.
  We need to:
  - quantify them,
  - study how they propagate between disciplines, and
  - work to reduce them.



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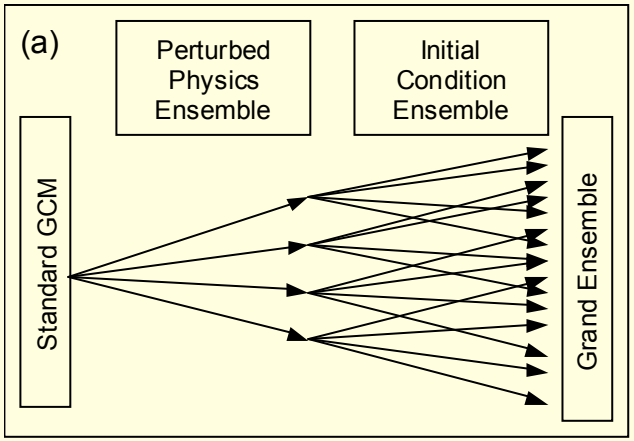
Uncertainty in Climate Sensitivity

- Climate sensitivity: the equilibrium global mean surface temperature change for a doubling of CO_2 levels.
- IPCC: likely to be between 1.5 and 4.5°C
- More recent studies allow for the possibility of high sensitivities (>6 °C) (e.g. Andronova et al. (2001), Forest et al. (2002), Knutti et al. (2002), Murphy et al. (2004))
- Why don't complex climate models show such behaviour?
- Sources of uncertainty in climate predictions:
  - Model response uncertainty.
  - Natural variability
  - Forcing uncertainty (e.g. GHG levels)



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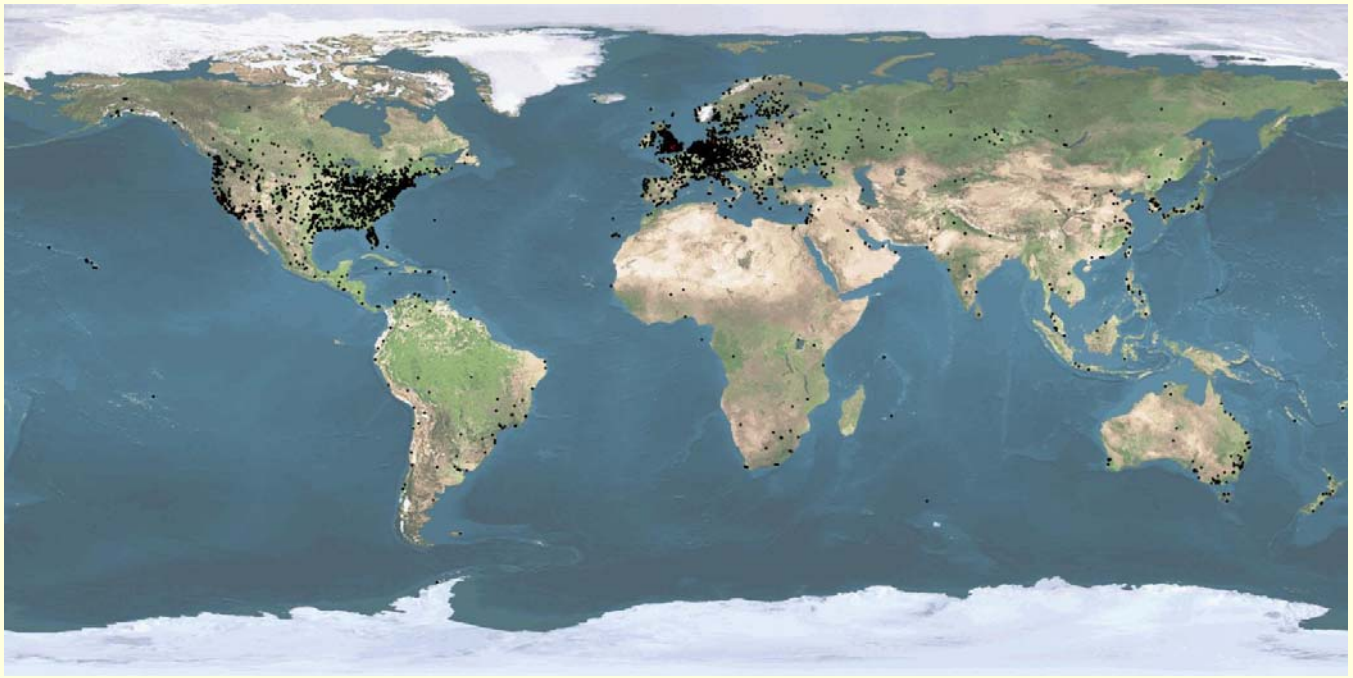
A Grand Ensemble with a General Circulation Model Requires Huge Computing Capacity

Hence climate*prediction*.net



95,000 participants from 150 countries
60,000 simulations (each 45 years long)
8,000 years of computing time

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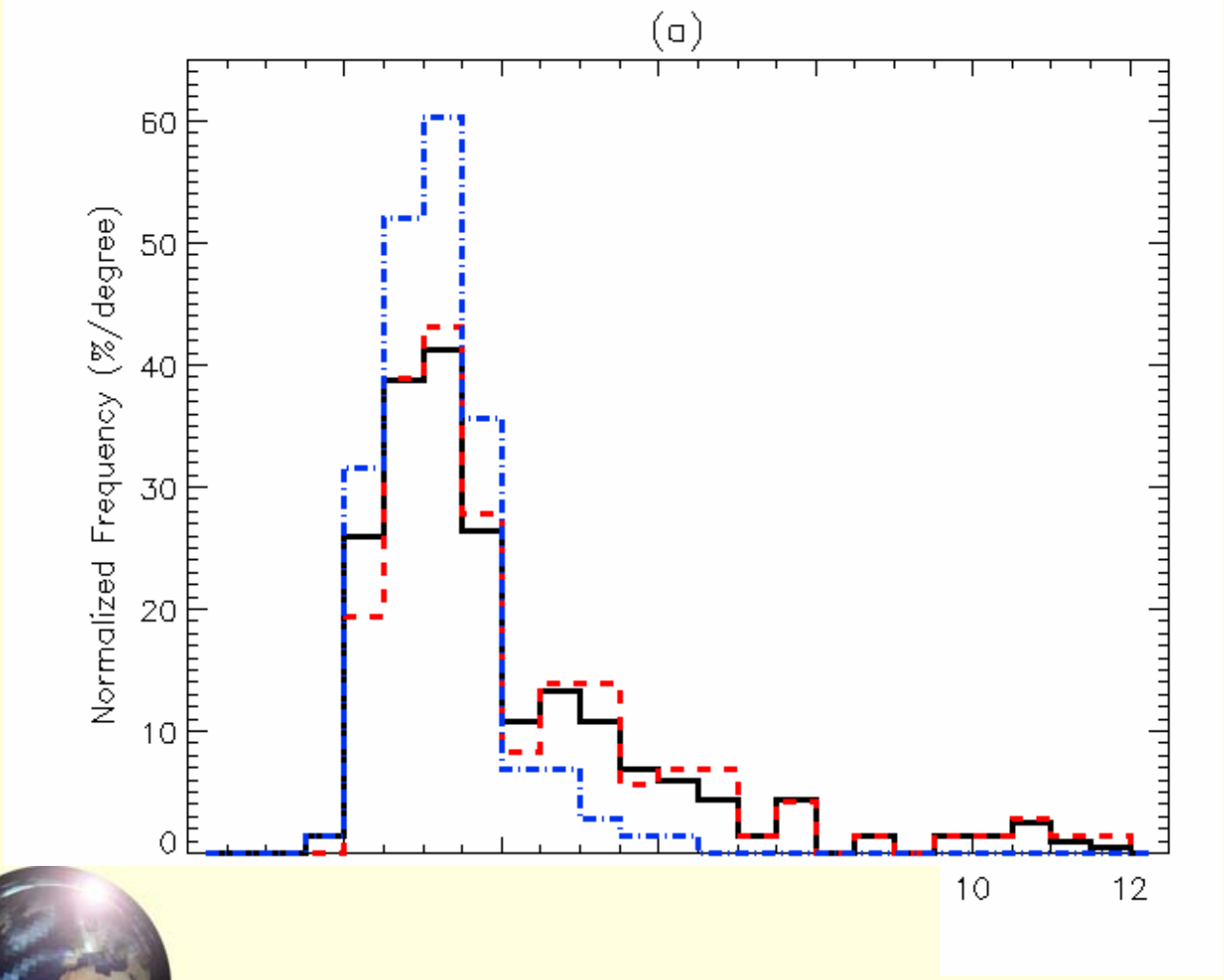
Grand Ensemble Frequency Distribution of Climate Sensitivity



<u>% > 8°</u>

Black:	4.2
Red:	4.9
Blue:	0.0

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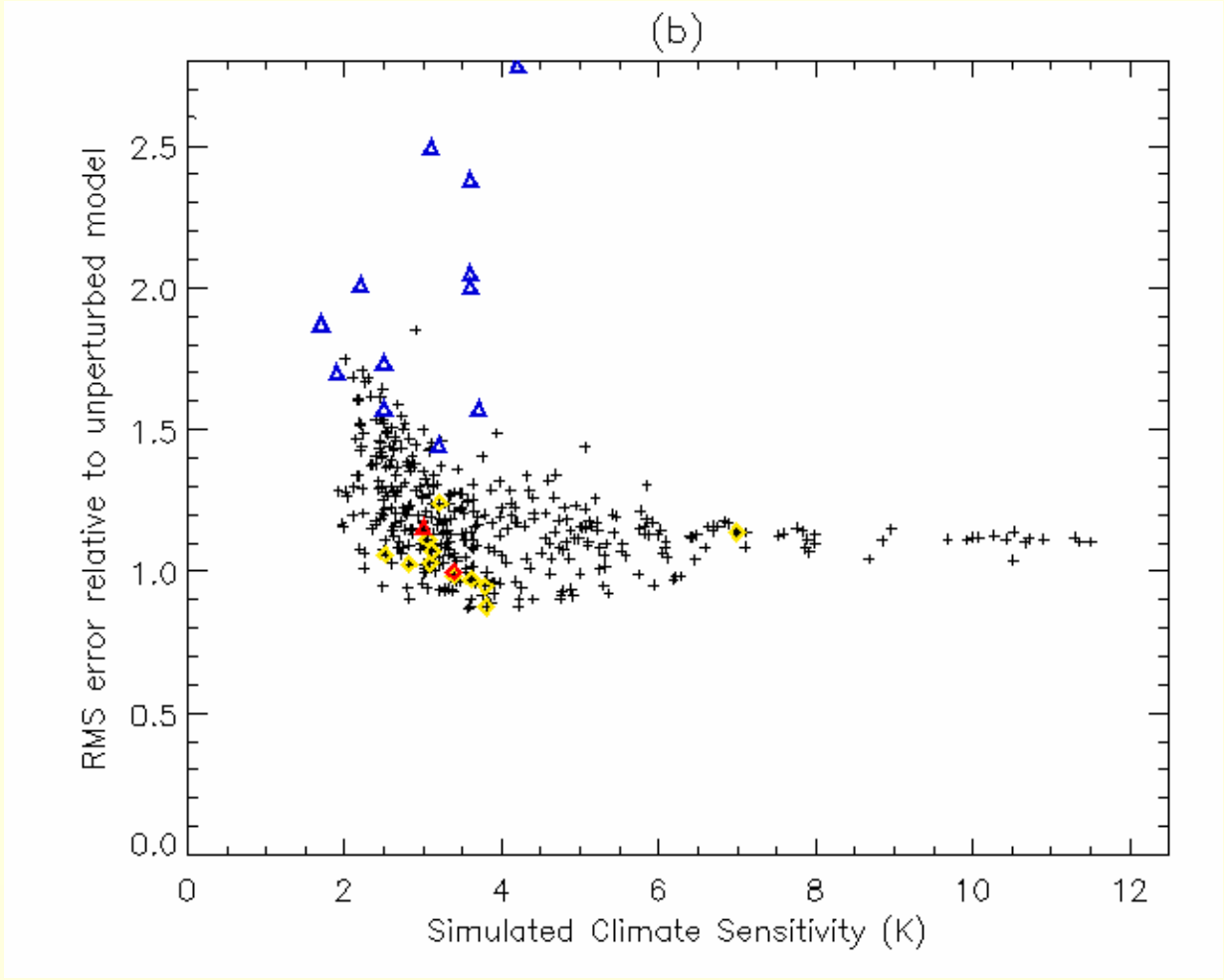
Can observations constrain the distribution?



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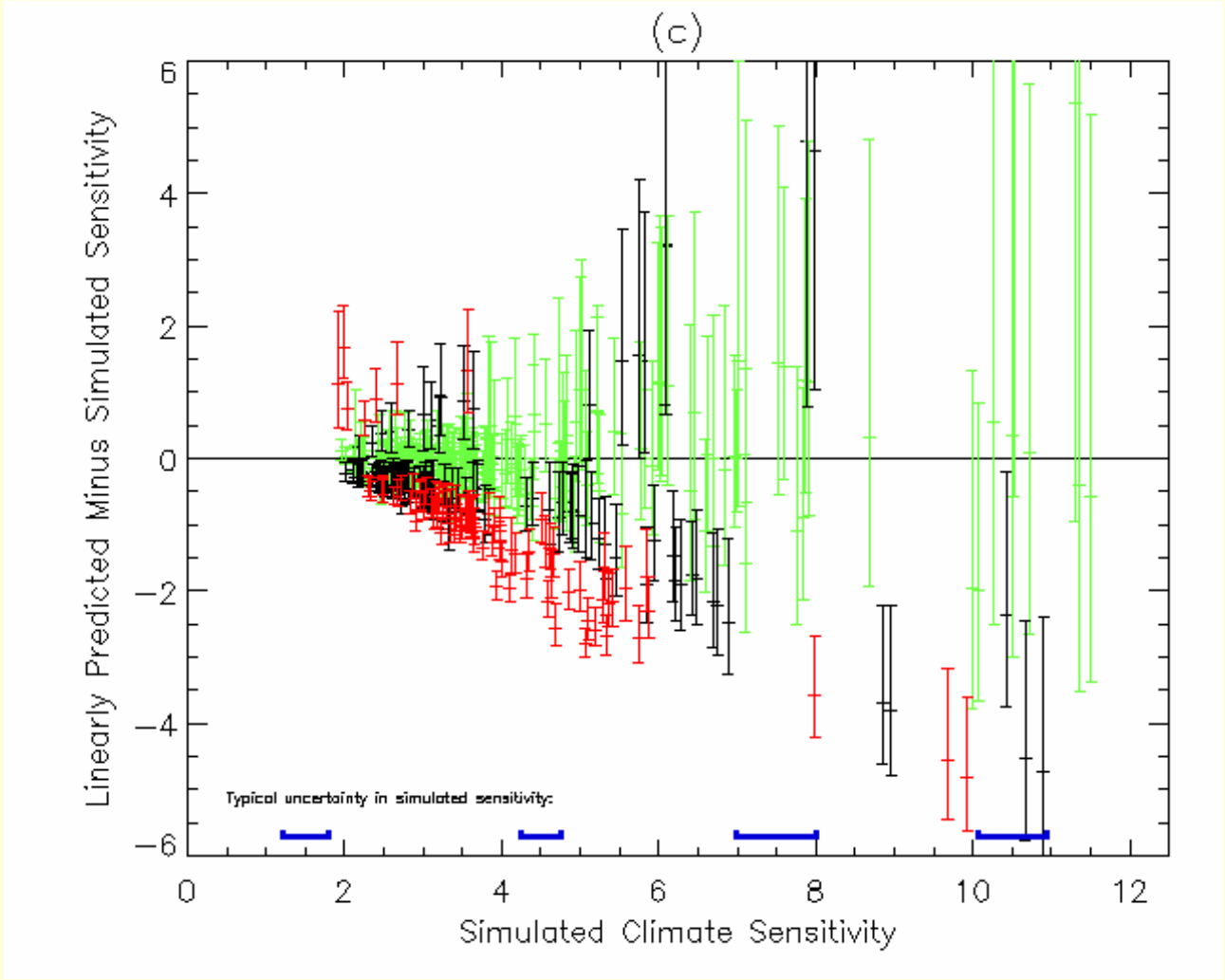
Do We Need So Many Simulations?
Can we Predict Behaviour from a Small Subset?



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Conclusions

- We can't yet rule out the possibility of extreme responses to relatively modest stabilization levels. Even current levels could lead to dangerous climate change.
- Climate predictions need to include uncertainty analyses. It comes hand in hand with confidence.
- Q3: "What technological options are there […] taking into account costs and uncertainties?"
  Inter-disciplinary uncertainty analysis will be important for future work in this area.
- Climate*prediction*.net and QUMP are working on transient 20th century simulations to look for better constraints.

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