

Extreme events/Fat tails

(Thanks to participants in the scoping meeting for the IPCC special report on Extremes and Disasters)

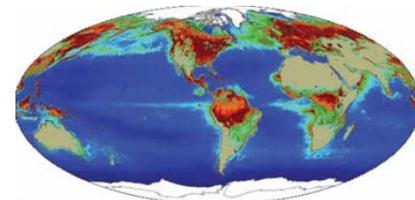
Chris Field

Carnegie Institution: Department of Global Ecology

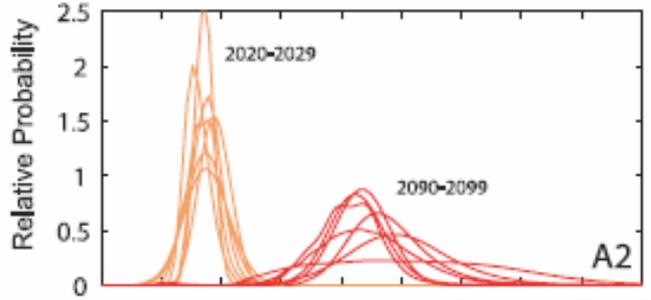
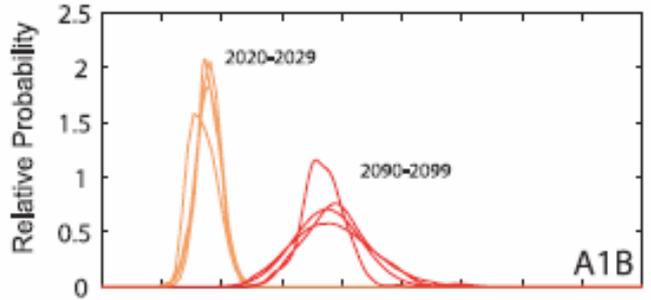
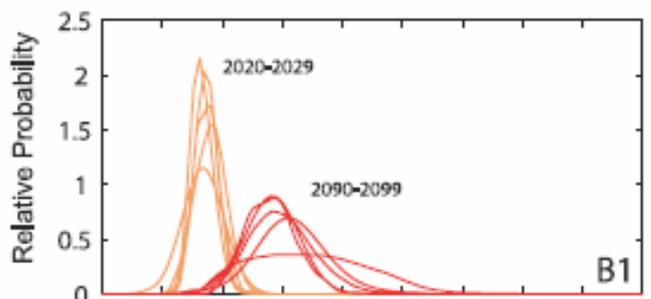
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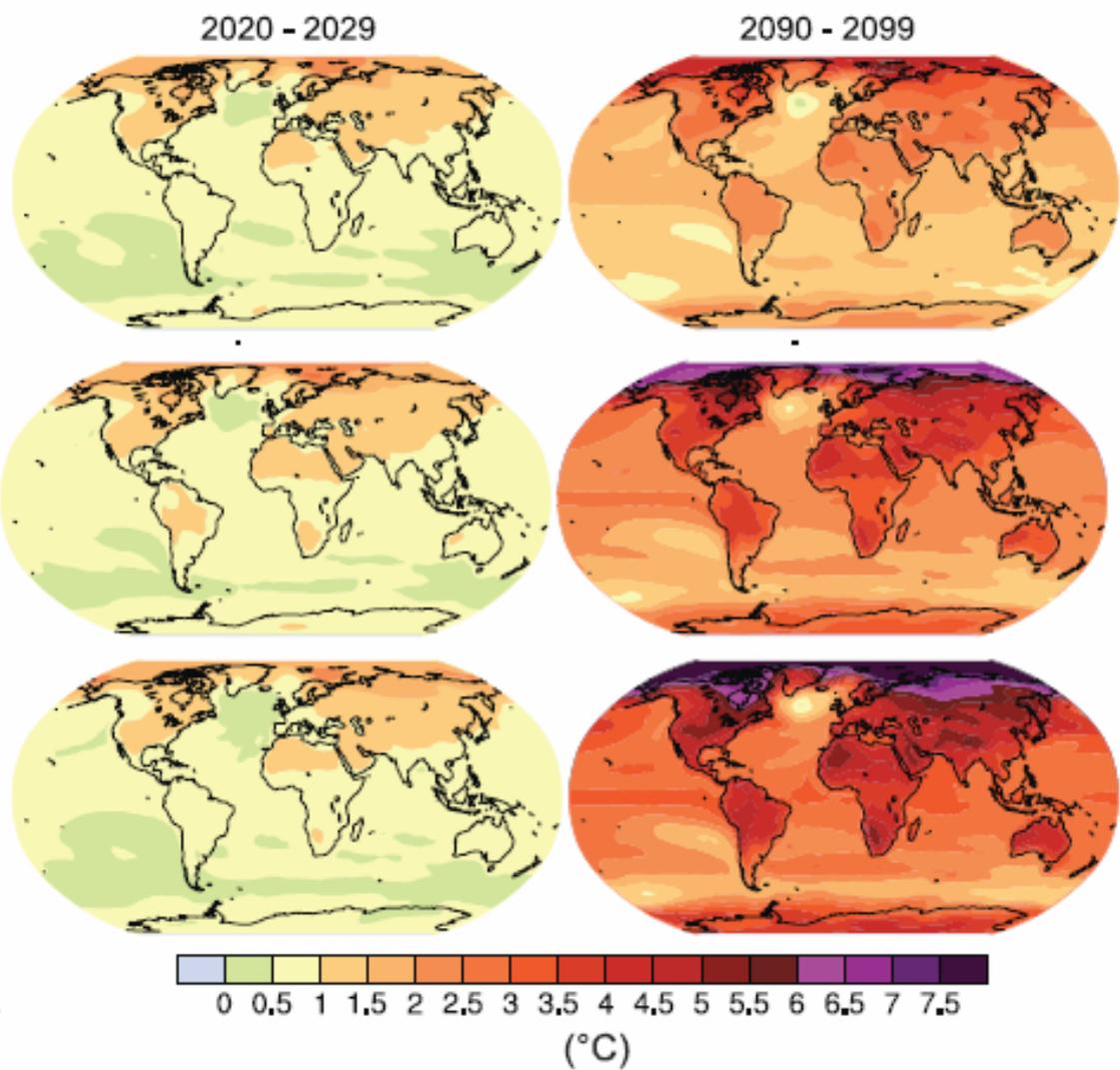
DEPARTMENT OF
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PROJECTIONS OF SURFACE TEMPERATURES

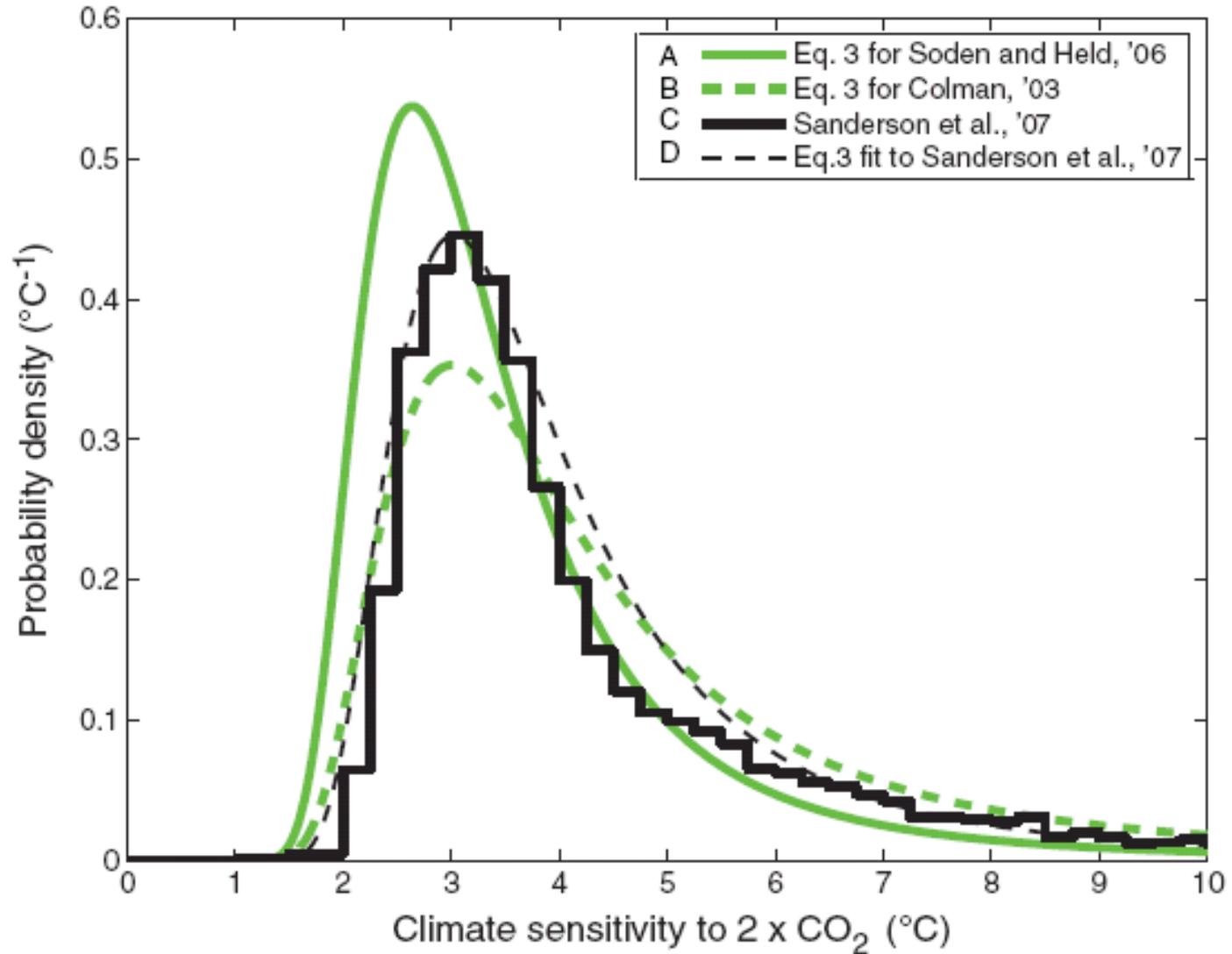


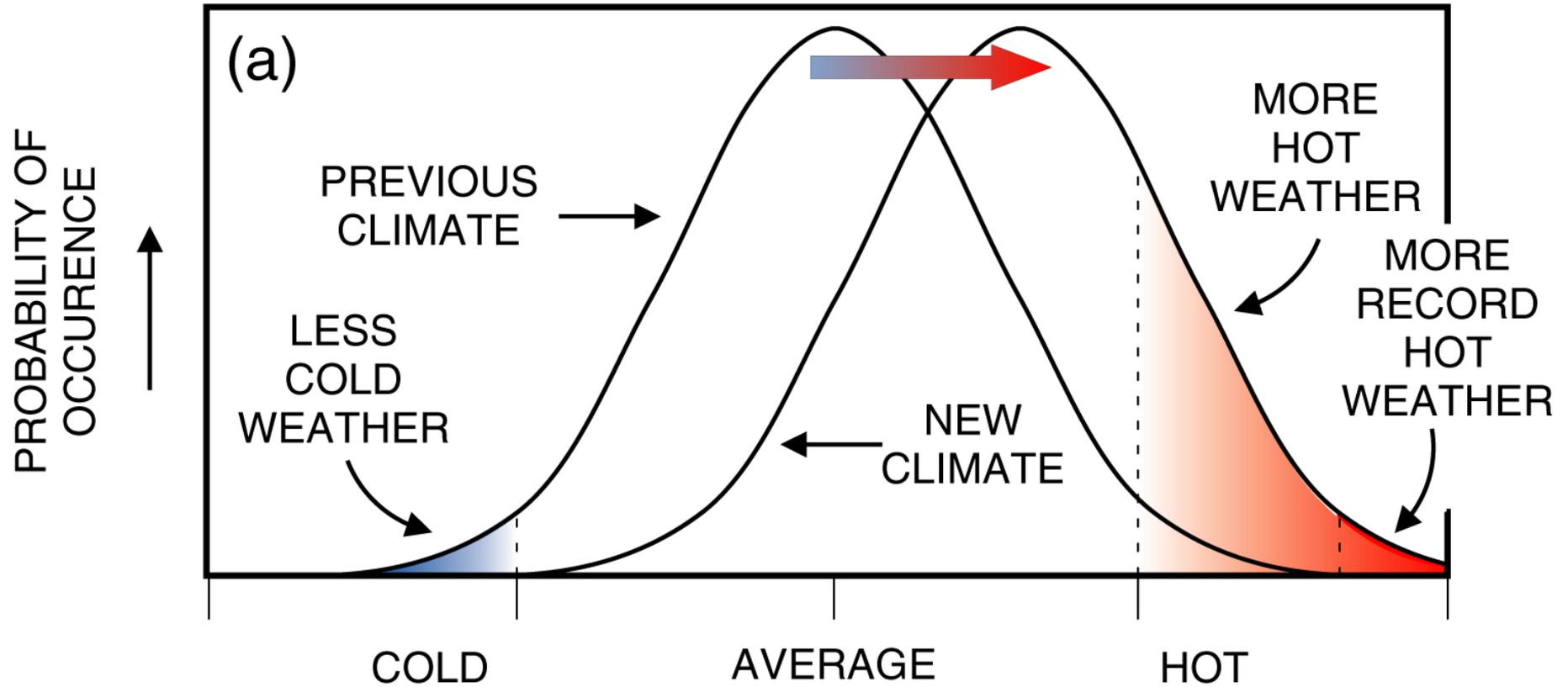
Global Average Surface Temperature Change (°C)



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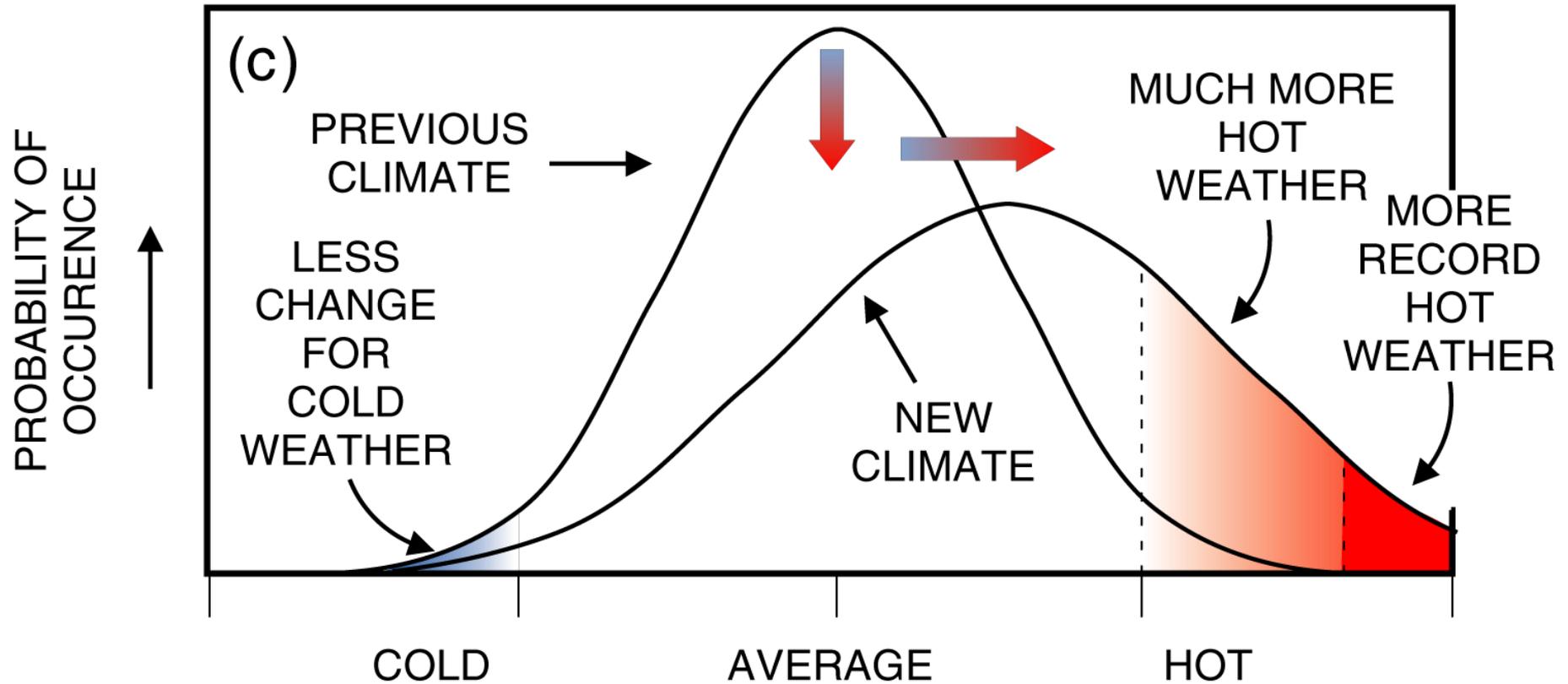
Intrinsic uncertainty in climate sensitivity ³





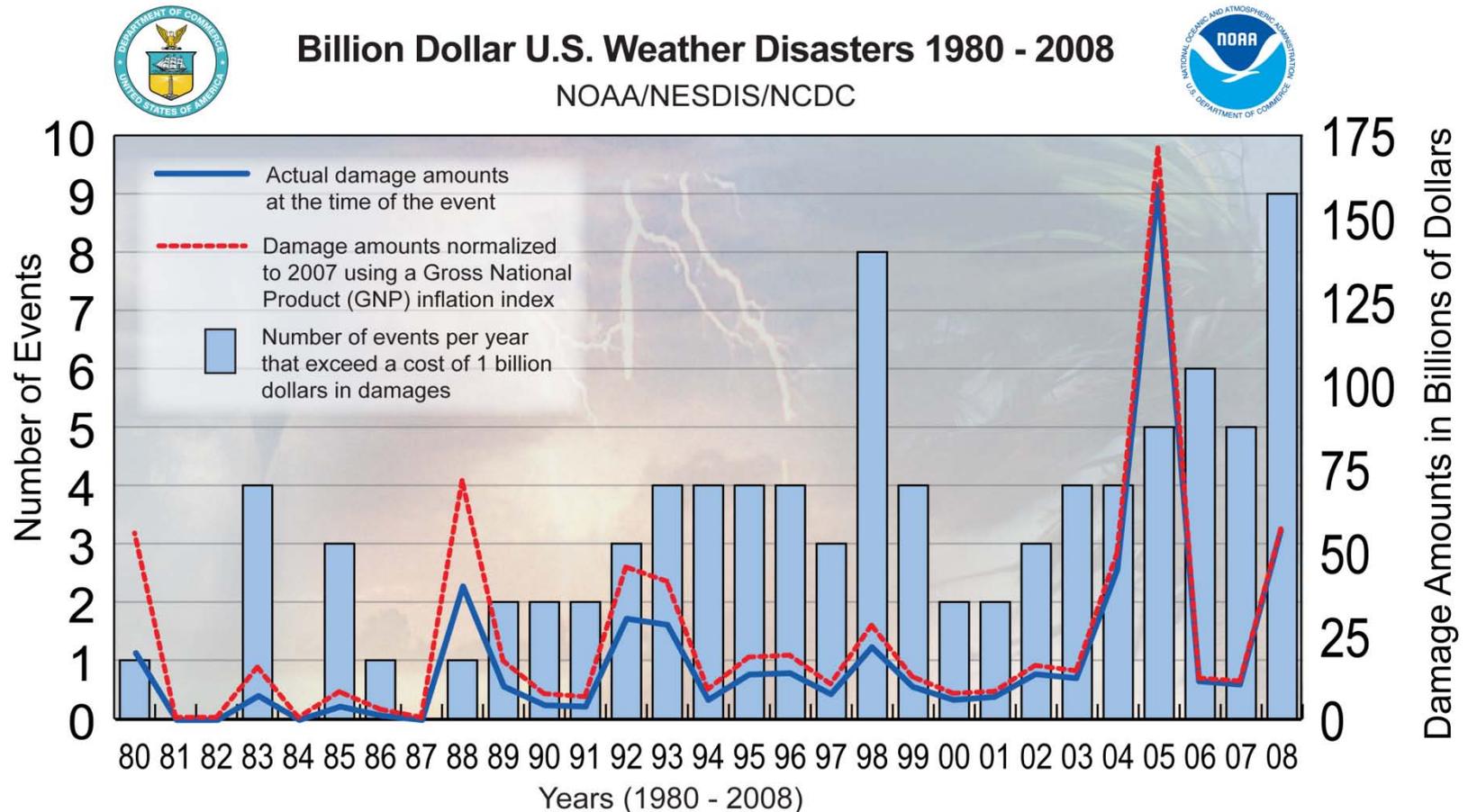
Large percentage change in extremes

INCREASE IN MEAN AND VARIANCE

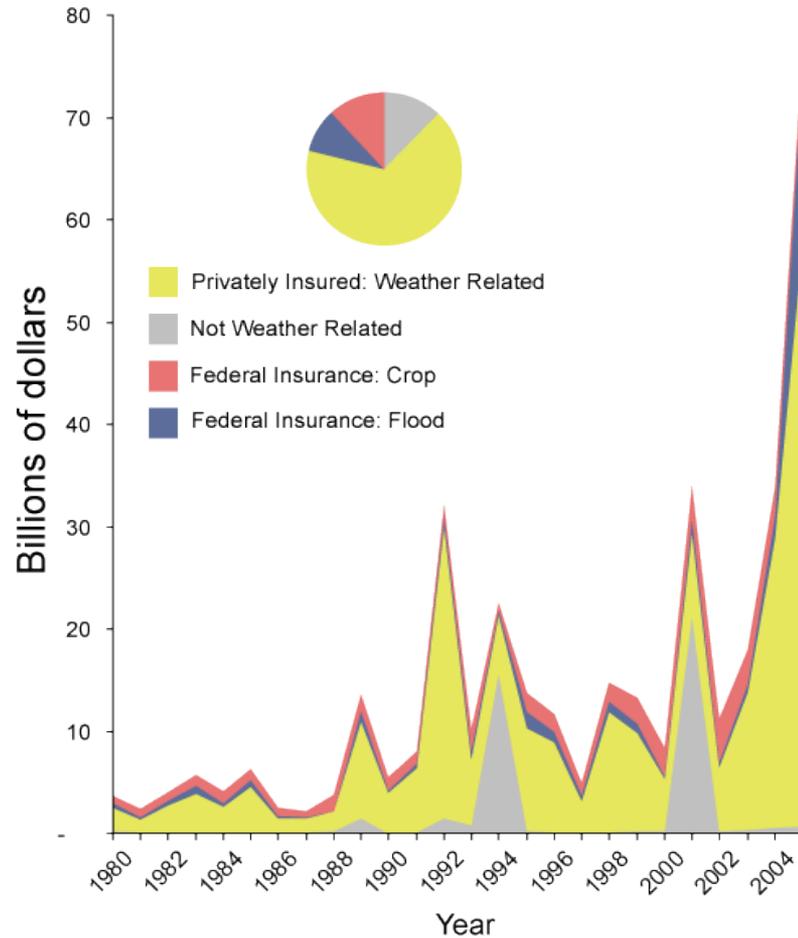


Much bigger percentage changes in extremes

Weather and climate extremes are among the most serious challenges to society in coping with global warming



Insured Losses from Catastrophes



- Weather-related insurance losses in the U.S. are increasing.

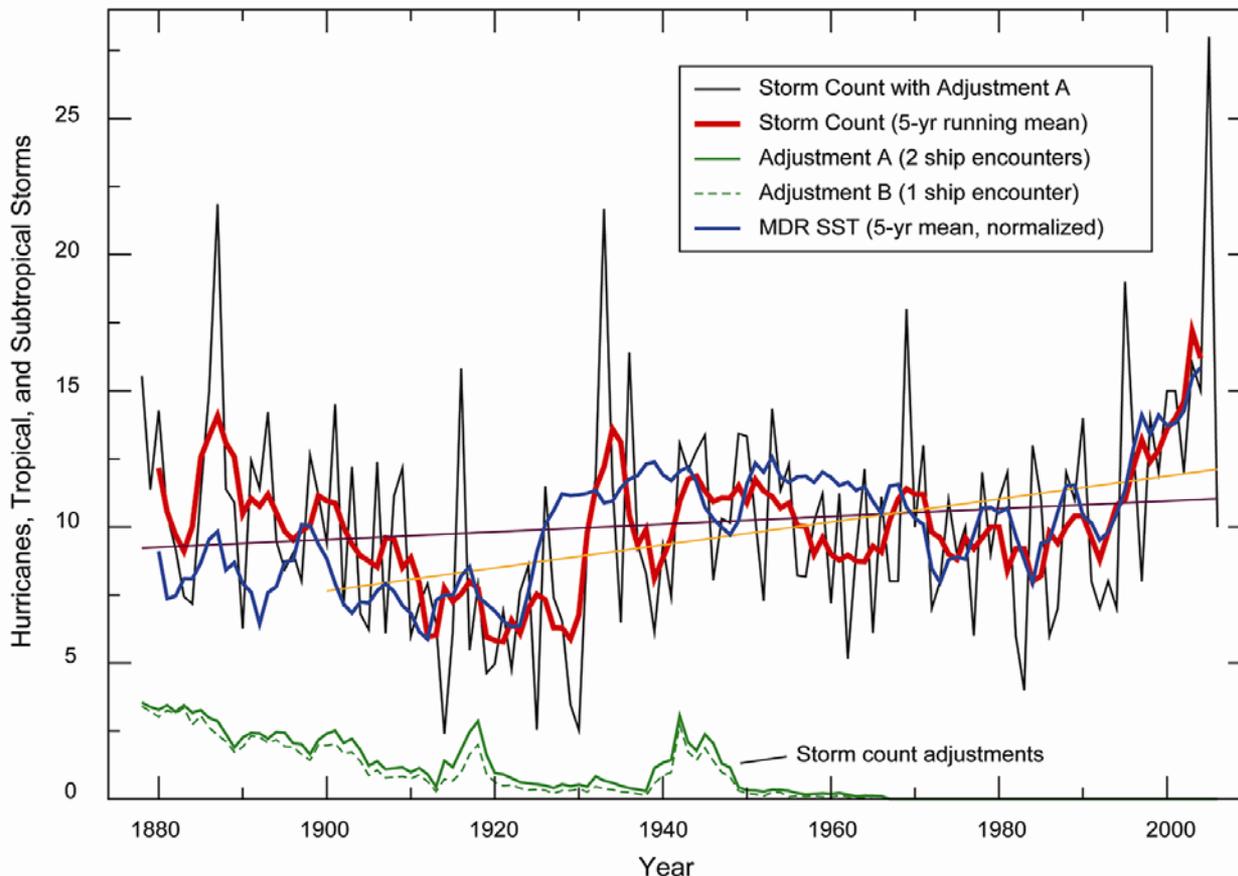
- Typical weather-related losses today are similar to those that resulted from the 9/11 attack (shown in gray at 2001 in the graph).

- About half of all economic losses are insured, so actual losses are roughly twice those shown on the graph.

STORMS & HURRICANES

Observed Changes and Uncertainty

Atlantic Hurricanes/Tropical Storms (Adjusted for Estimated Missing Storms)



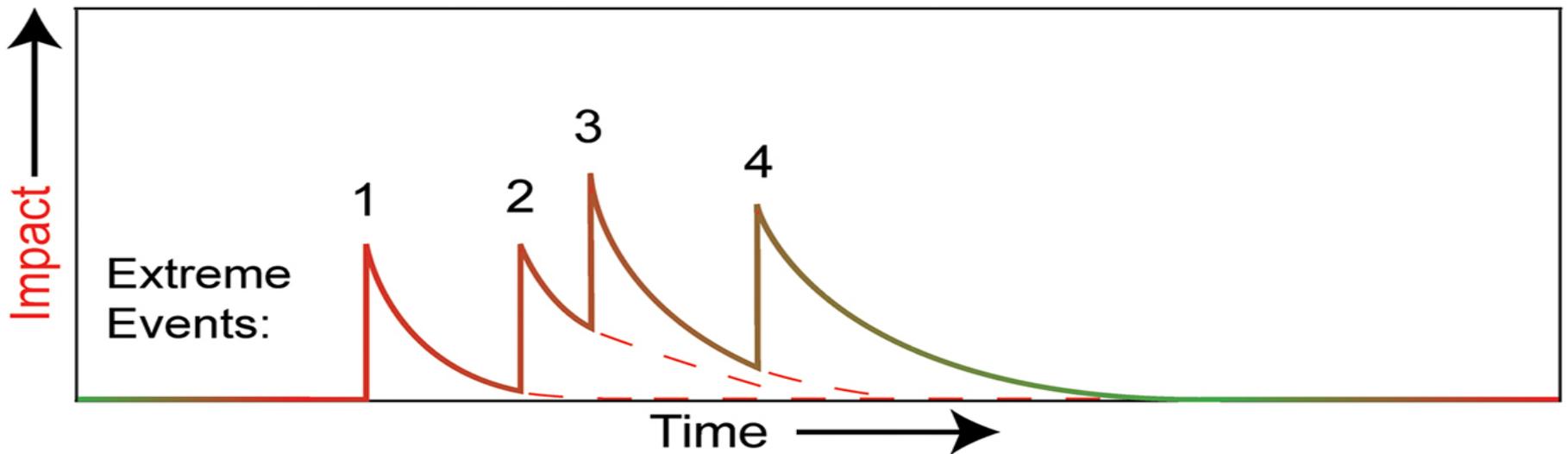
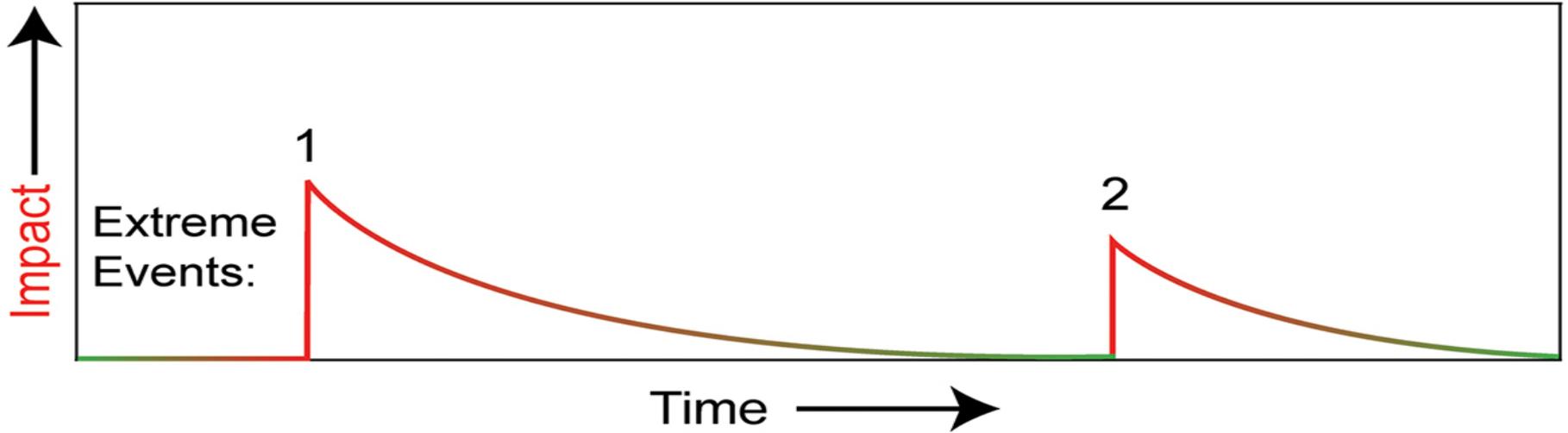
Atlantic hurricanes and tropical storms for 1878-2006, adjusted for missing storms.

Black curve is adjusted annual storm count,

Red curve is 5-year running mean, and

Blue curve is a normalized 5-year running mean SST index for Main Development Region

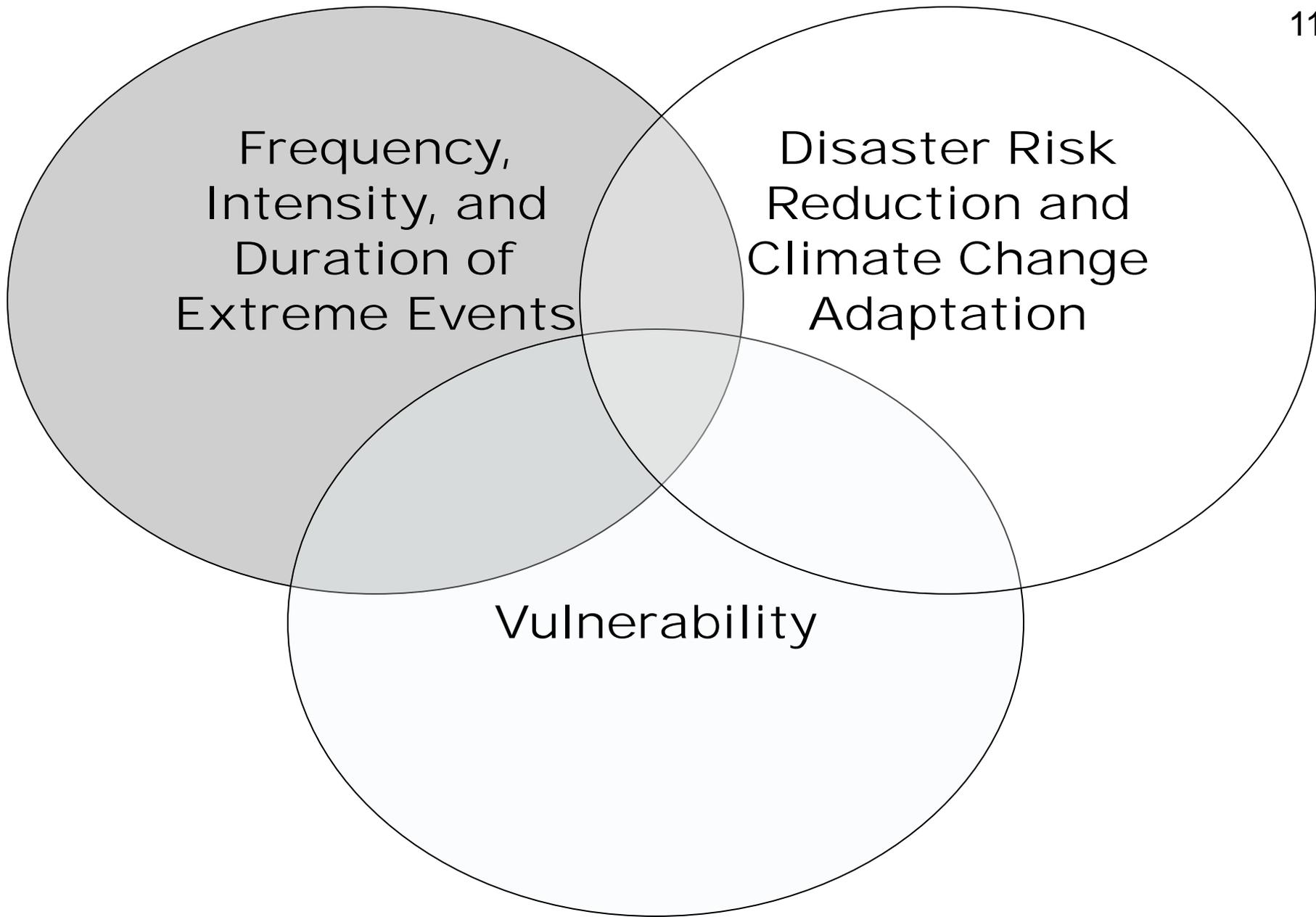
Extreme Events and Recovery of a System



Issues for extremes

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- ◆ Data are "messy"
- ◆ Often data are not available with right sampling
- ◆ Spatial scales vary: tornadoes to droughts
- ◆ Extremes are inherently rare
- ◆ Terminology: High impact but not really extreme?
- ◆ Model definitions are often different
- ◆ Model grid box value may not be comparable to mean of grid box from observations



IPCC Special Report:

"Managing the Risks of Extreme Events to Advance Climate Change Adaptation"

- 1. Climate change: New dimensions in disaster risk, exposure, vulnerability, and resilience*
- 2. Determinants of risks: Exposure and vulnerability*
- 3. Changes in climate extremes and their impacts on the natural physical environment*
- 4. Changes in impacts of climate extremes: human systems and ecosystems*
Regional aspects of vulnerability, exposures, and impacts
- 5. Managing the risks from climate extremes at the local level*
Data as input for risk management, including challenges
- 6. Managing the risks from climate extremes at the national level*
- 7. Managing the risks: International level and integration across scales*
- 8. Toward a sustainable and resilient future*
- 9. Case studies*