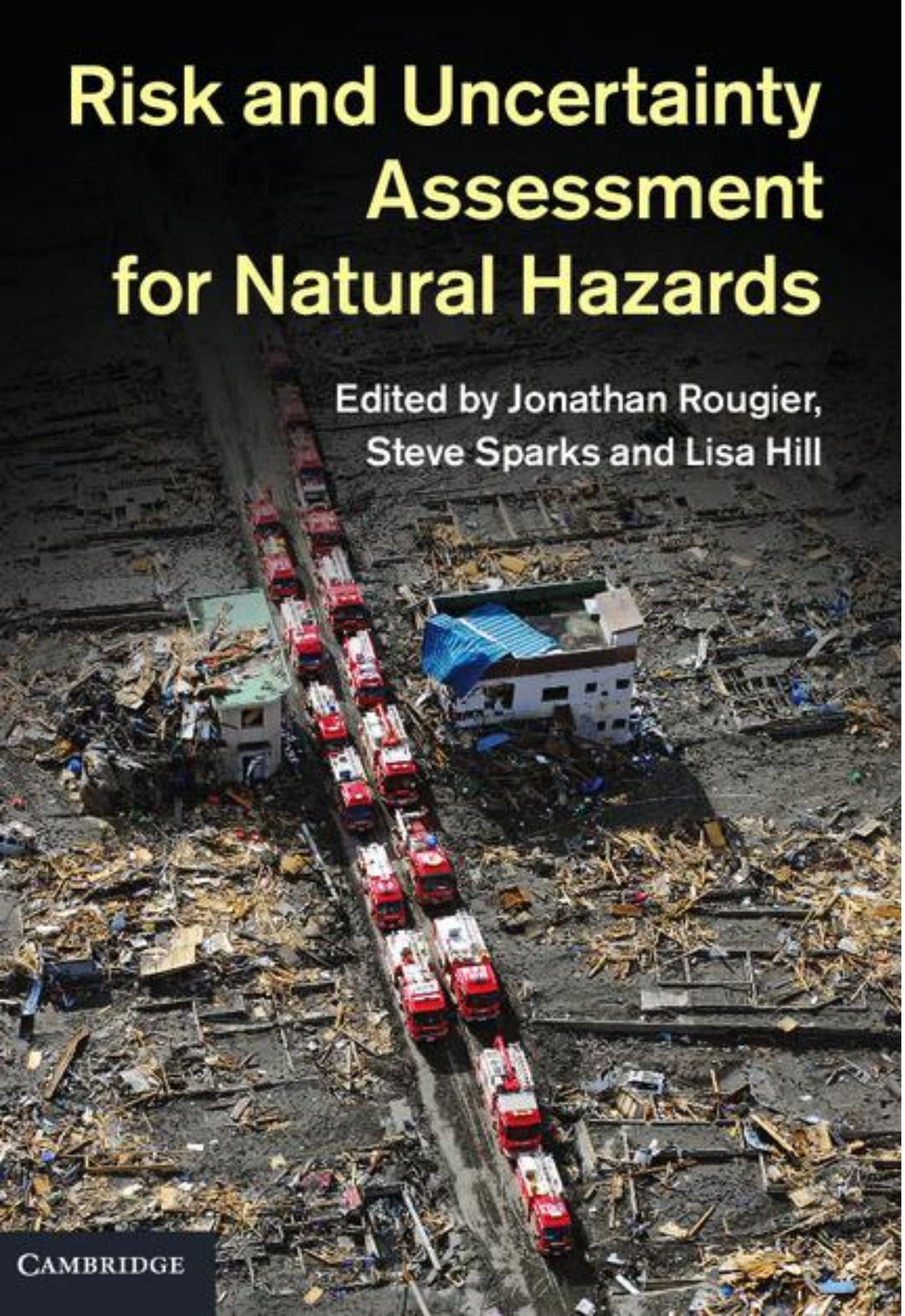
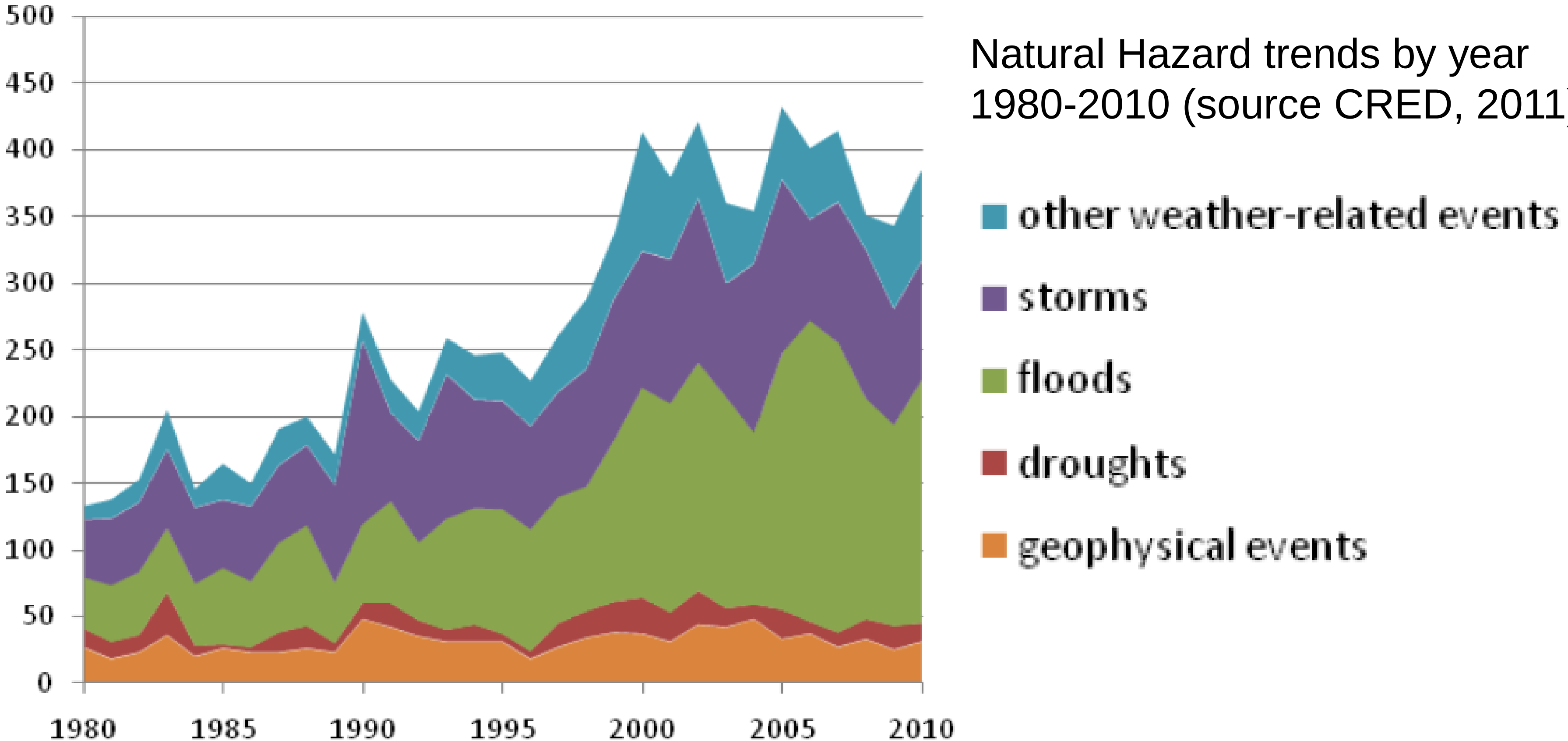


Scope: natural hazards

- earthquakes
- volcanoes
- floods
- storms (hurricanes/typhoons)
- droughts, fires
- tsunamis
- wildfires
- toxicology
- landslides
- climate change risk (e.g. sea level, more storms)
- space weather

Hazard & Risk assessment

Uncertainty



Natural Hazard trends by year 1980-2010 (source CRED, 2011)

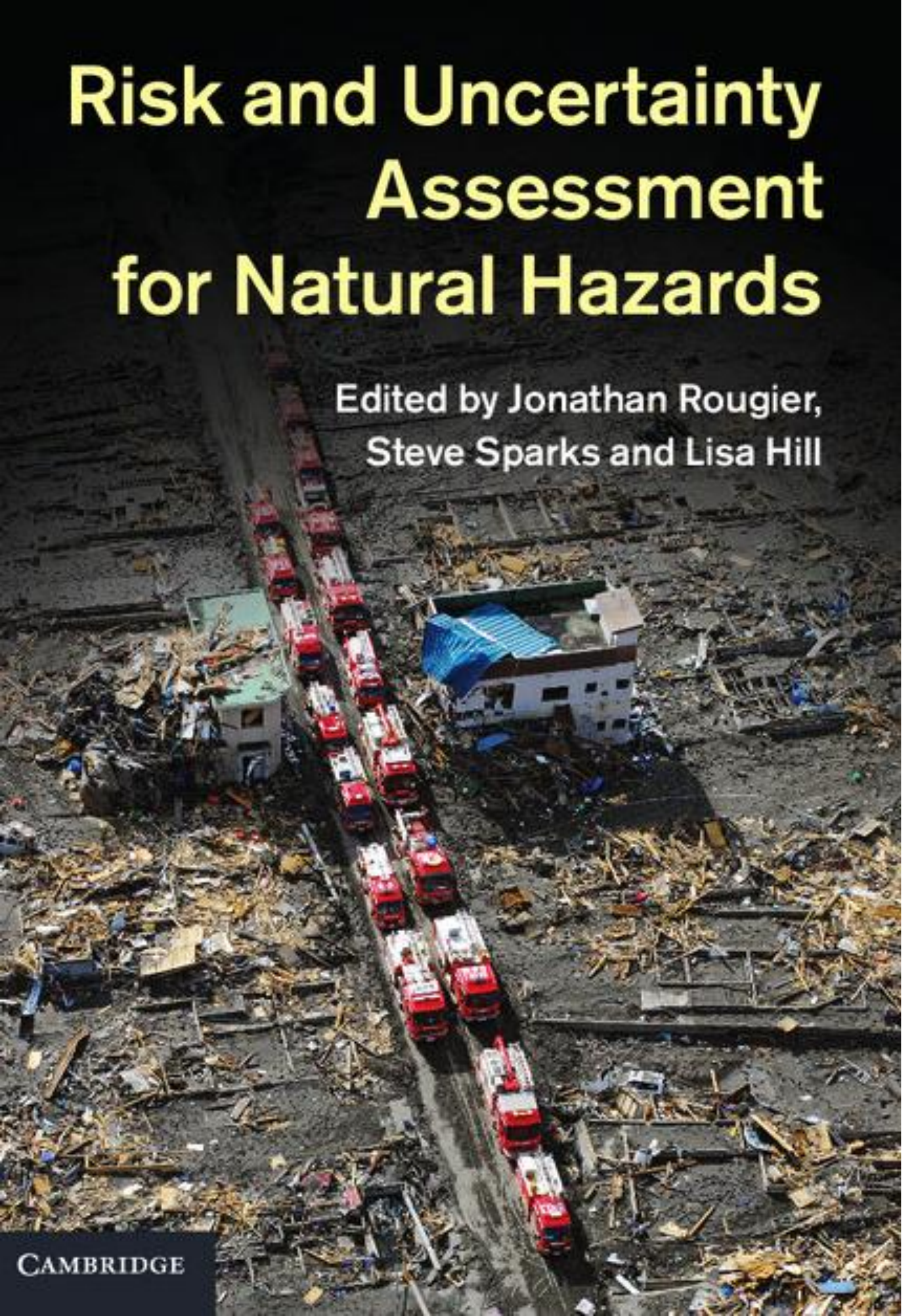
Natural disasters are increasing

High income countries: <1% GDP

Low income countries 10 to 15% GDP

High profile disasters: Tohoku earthquake, Iceland ash, Thai floods

Global reach of natural hazards disasters



Background to book

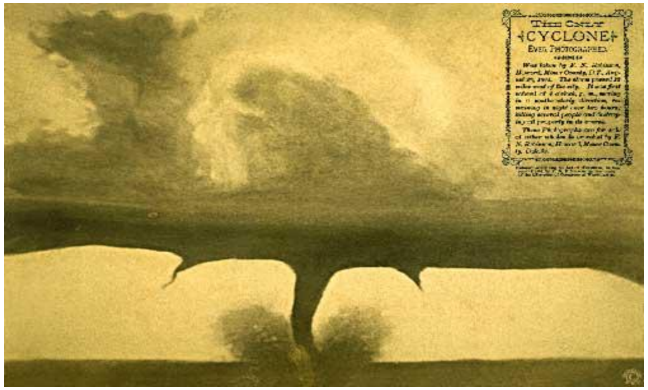
NERC Scoping SAPPUR: NERC Scoping Study on Uncertainty and Risk in Natural Hazards

Project (SAPPUR) won by Bristol Environmental Risk Research Centre (BRISK)

Advisory report to NERC in November 2009

Decision to turn study into a book

NERC funds thematic programme PURE based on SAPPUR report

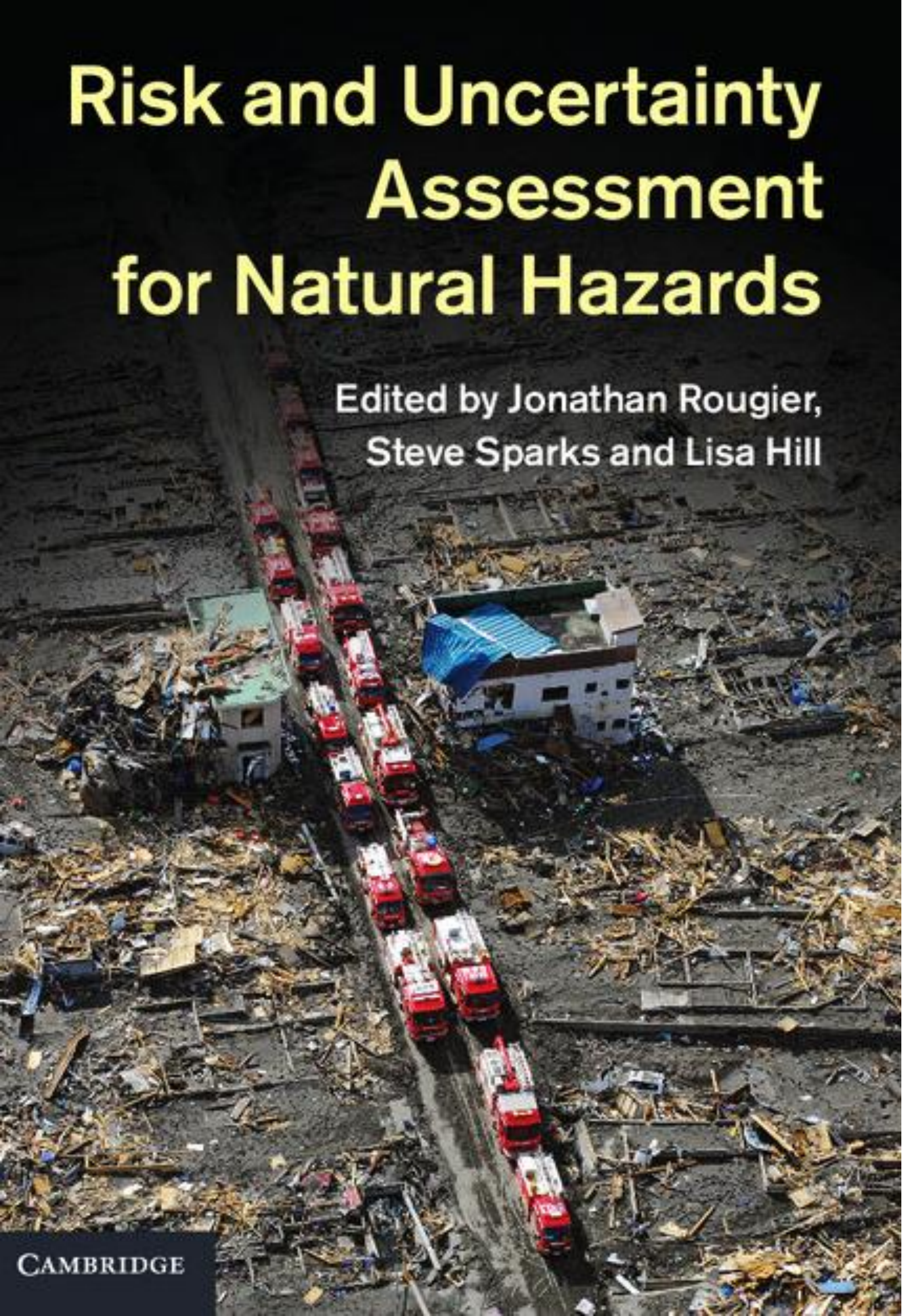


Interdisciplinary topic

Natural science, statistics &social sciences

Integration of hazards science: models, data, monitoring, experiment

Integration of science into human actions and decision-making



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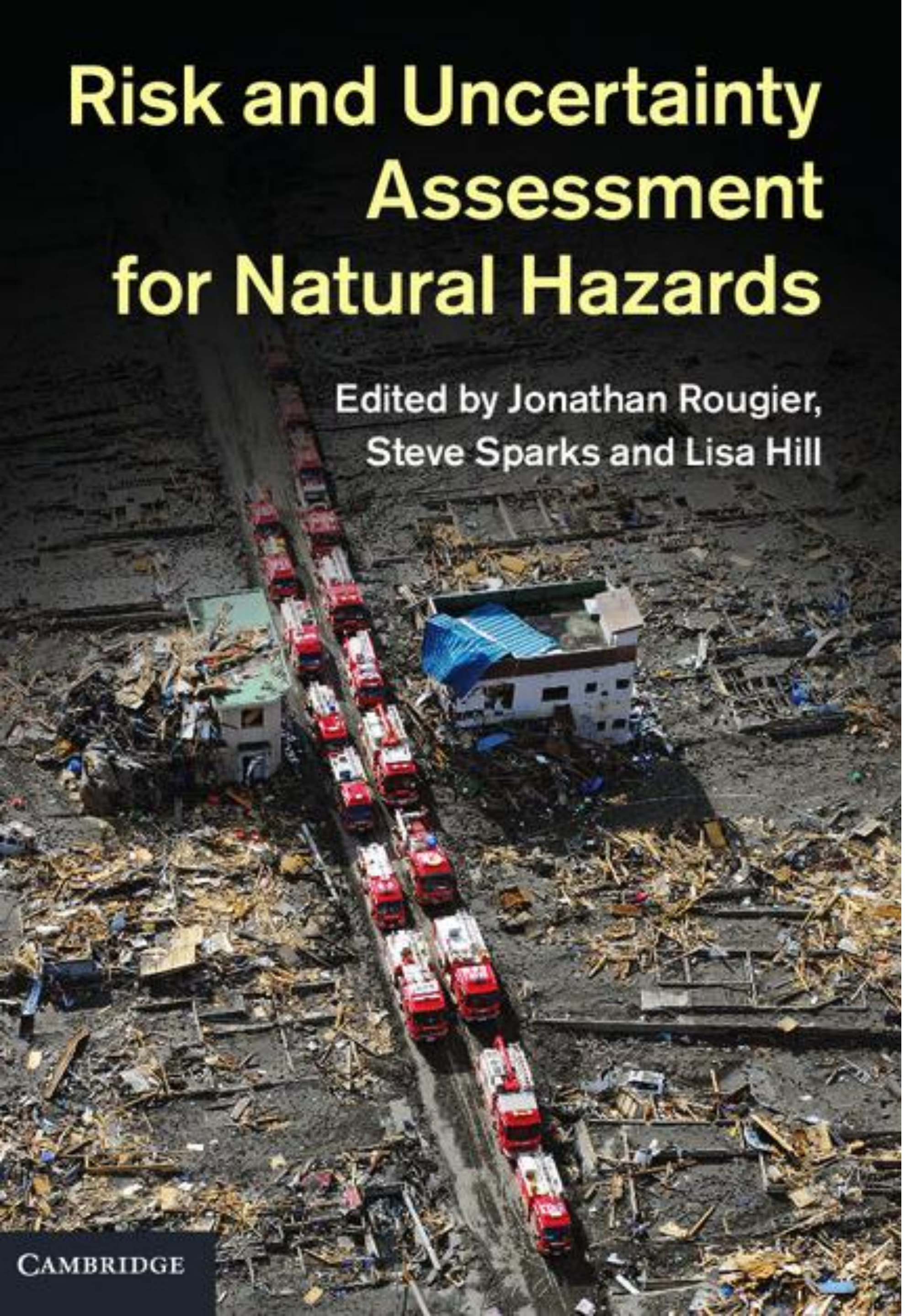


Major topics

Statistical framework for risk and uncertainty assessment

Major Natural Hazards

Climate change

Ecotoxicology

Technological Facilities

Expert elicitation

Social science perspectives

Some Key Messages

Understanding the natural hazard emergency cycle

Quiescence	Planning, Mitigation
Imminent threat	Early warning, preparation
The event	Forecasting, management
Recovery	Lessons learnt

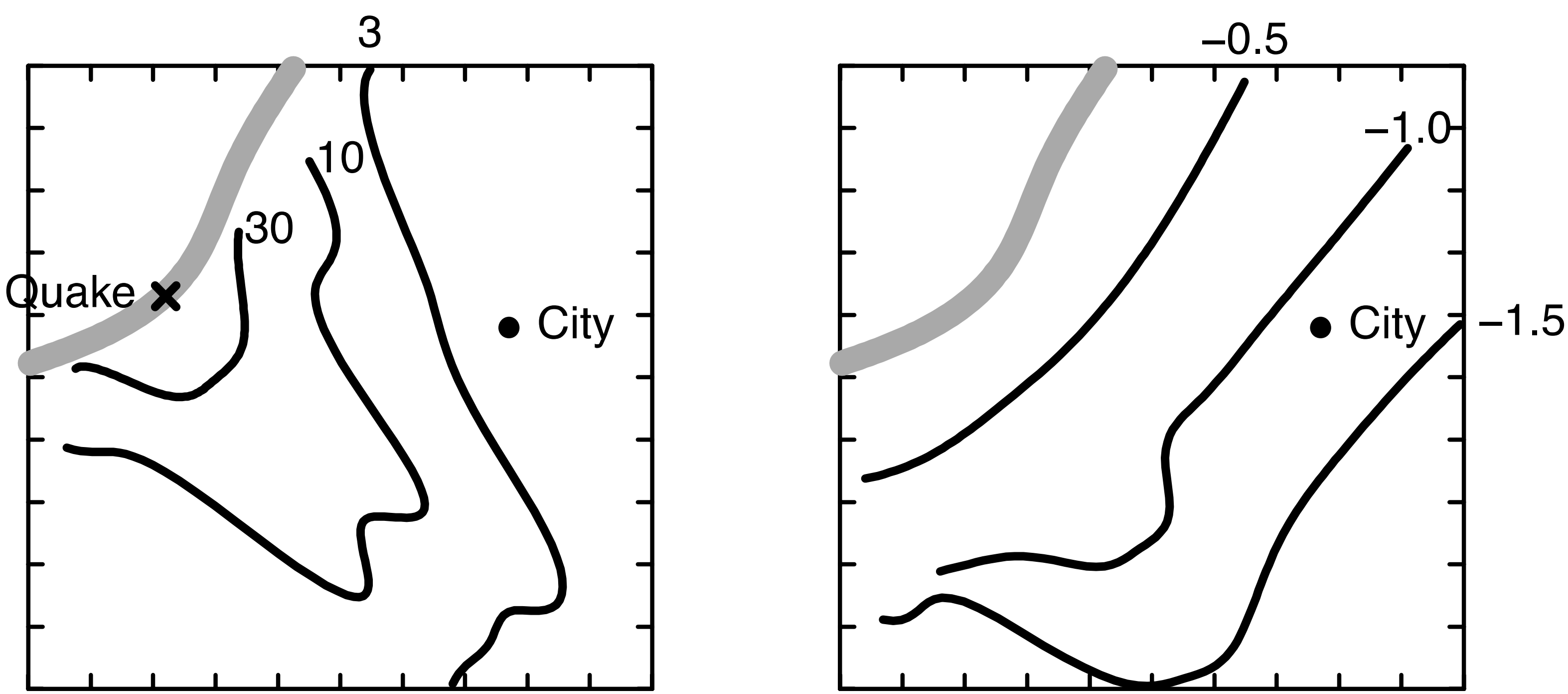
Disaster Risk reduction: far too little spent on planning
Science can contribute through anticipation of future emergencies

Some Key Messages

From hazard footprint map to probabilistic map to loss

Quantitative, systematic hazard & uncertainty assessment

A. Single event, PGA cm/s^2 B. Prob threshold exceedance, $\log_{10}$



Mag. 5.1 event, focal depth 9.3 km Thirty year period, PGA threshold 5cm/s^2

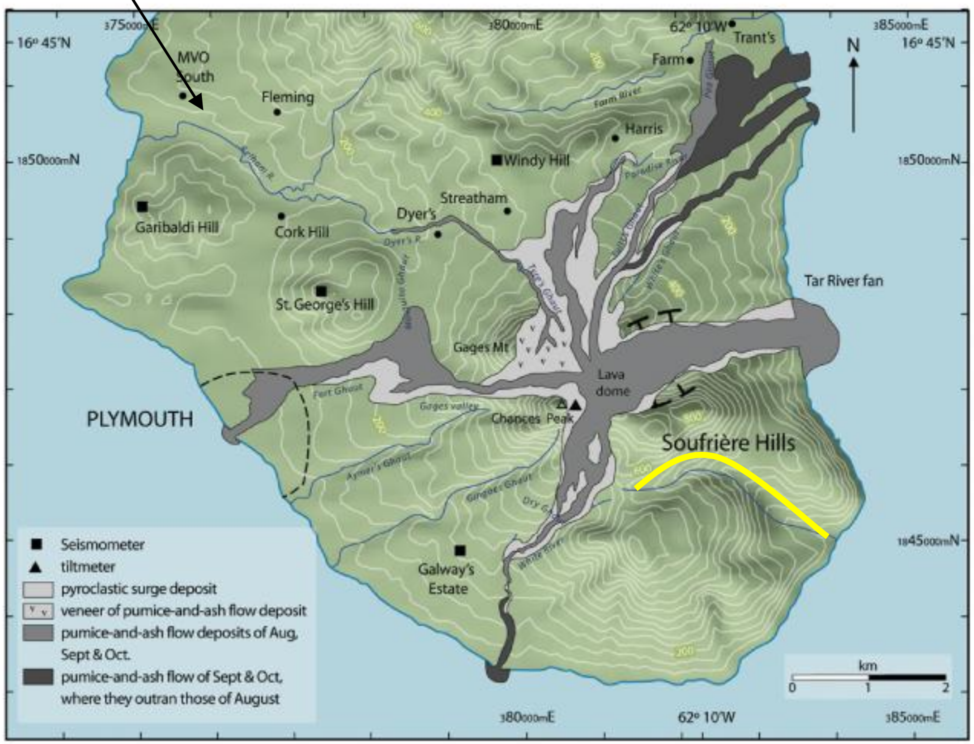
Some Key Messages

Hazard footprint maps require analysis of the past, modelling of the future and complete understanding of the uncertainties

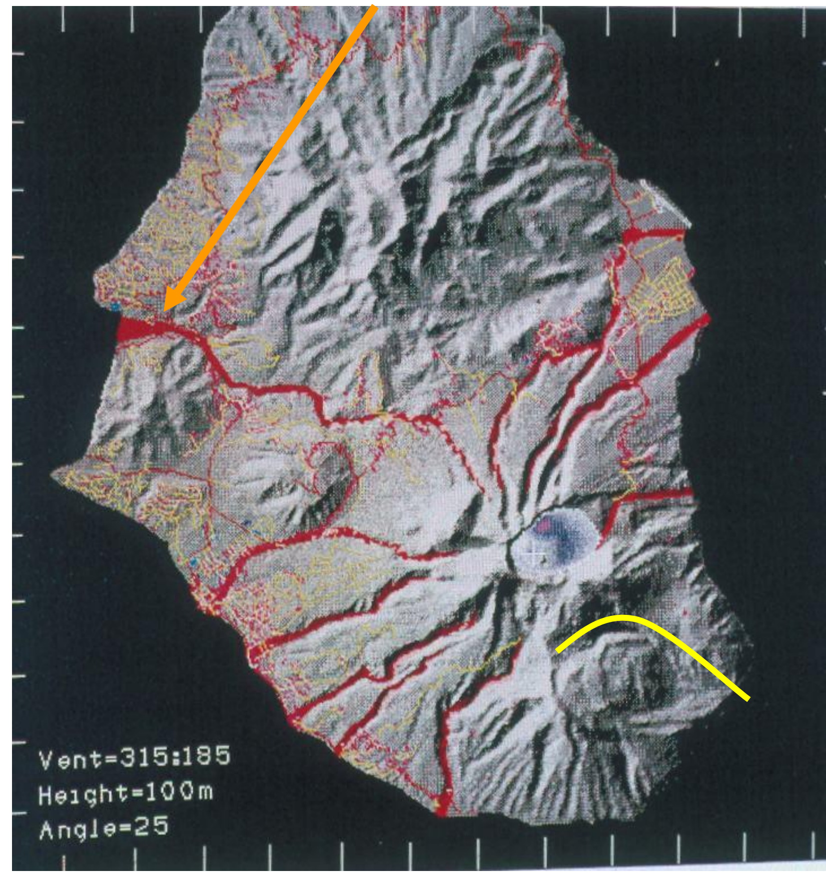
Predicted Flows

No flows

Yellow is unexpected flow



Pyroclastic flow deposits Montserrat (1996-1997)

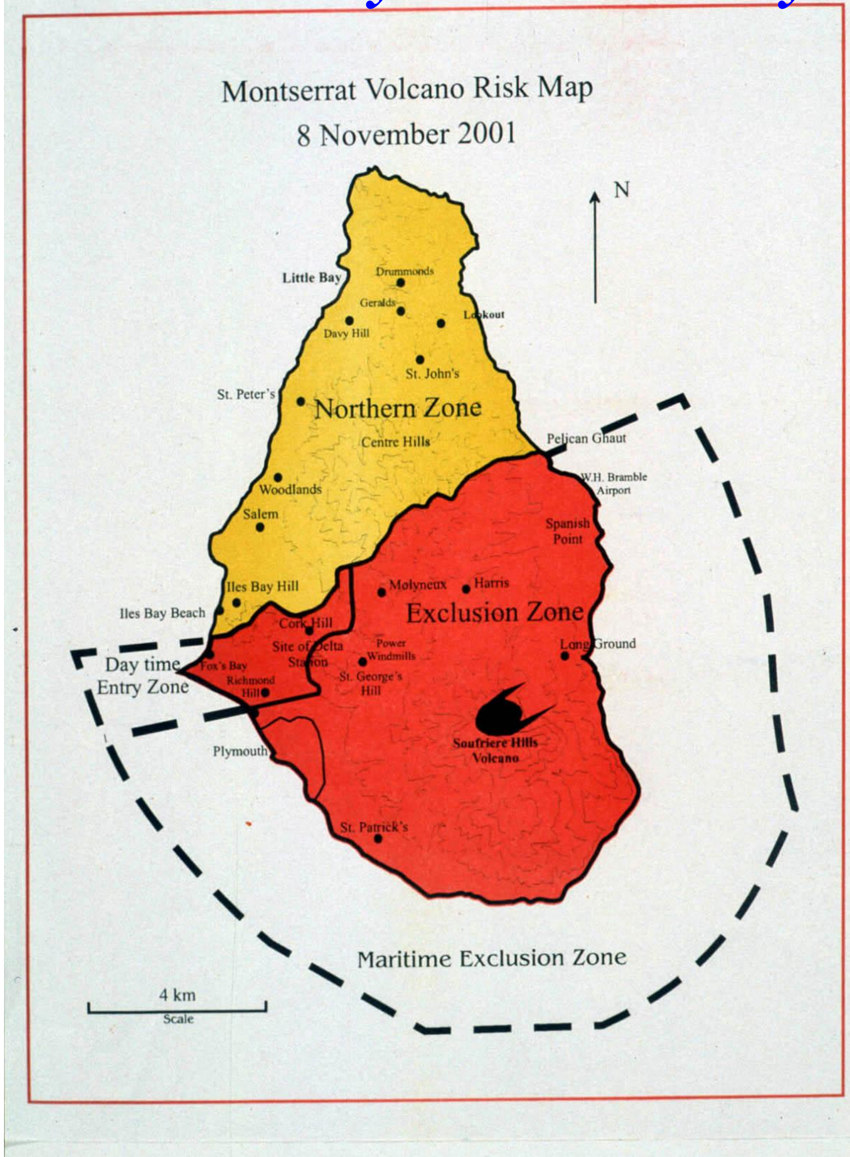


Pyroclastic flow models

Some Key messages

Hazard and risk assessment has to be probabilistic

Uncertainty assessment key to decision-making



Administrative zone maps are developed from hazards map but take account of other factors (e.g. roads, infrastructure, etc)

These maps used for planning and crisis management

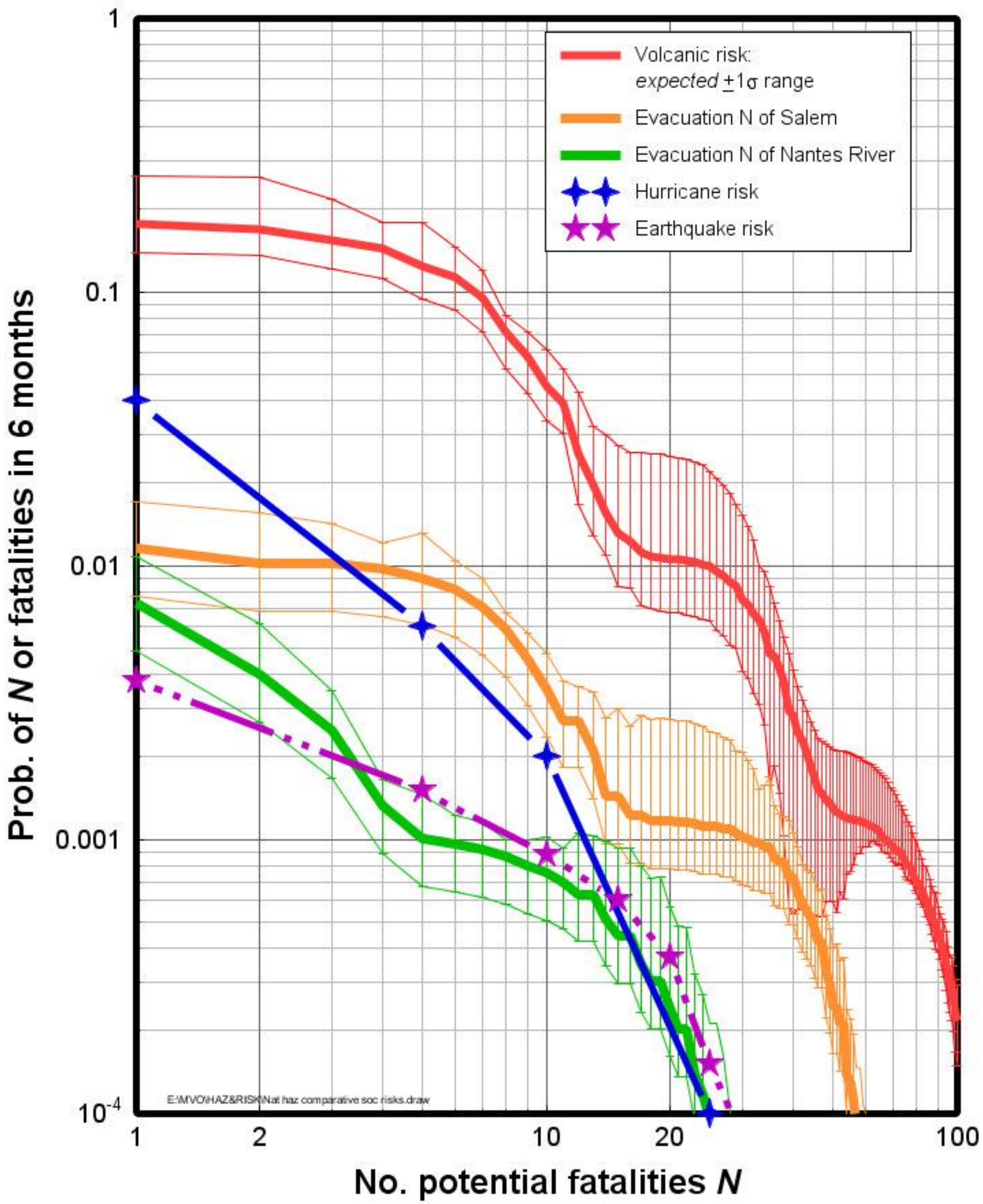
Probabilistic and risk basis for drawing lines on maps

Dilemma of loss of life versus loss of assets

Key Messages
Methods to support risk informed decisions

Structured expert judgement and Montserrat volcano:

Societal F-N risk curves derived using elicitations to quantify hazard and exposure levels and associated uncertainties



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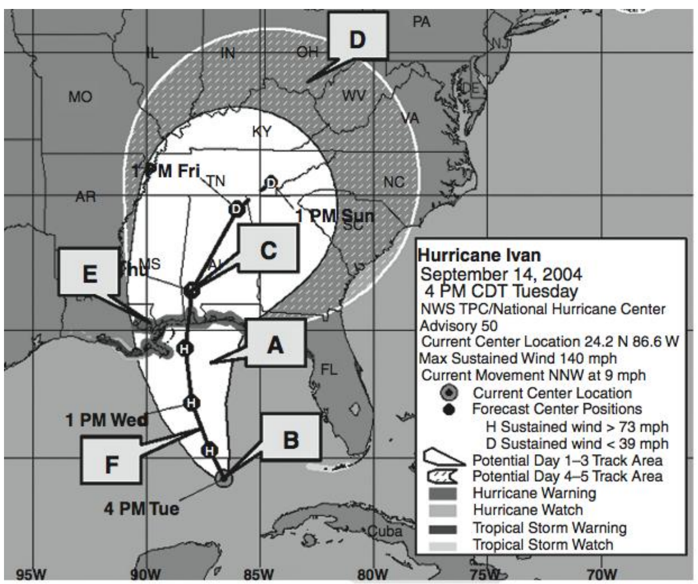
Living with global uncertainty

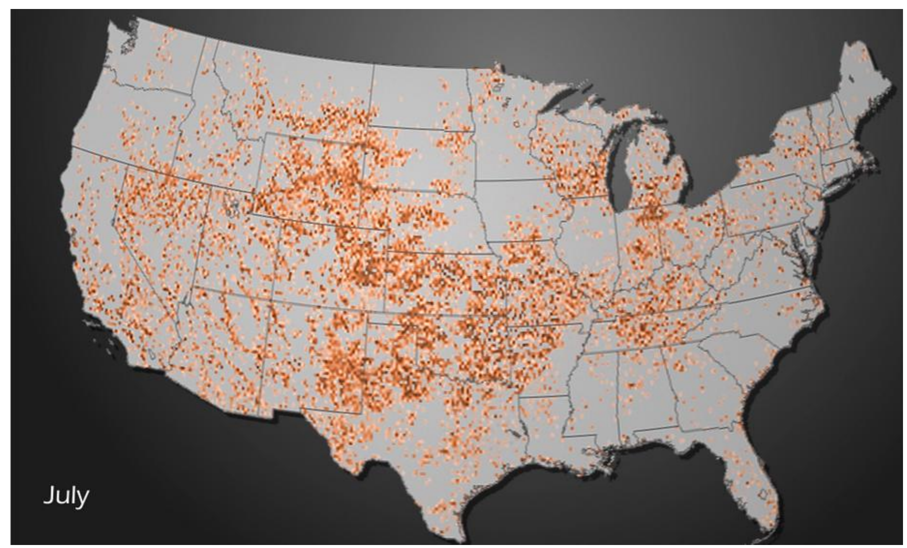
Risk and uncertainty in hydrometeorological hazards


Tamsin Edwards & Peter Challenor

Overview of many hazards
Short-term forecasts and long-term analysis
Risk management
Pitfalls in communicating forecast uncertainty



Hurricane “cone of uncertainty”



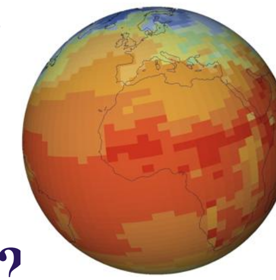
Vegetation stress during 2012 drought

Hydrometeorological hazards under future climate change

University of BRISTOL
CABOT INSTITUTE
Living with global uncertainty

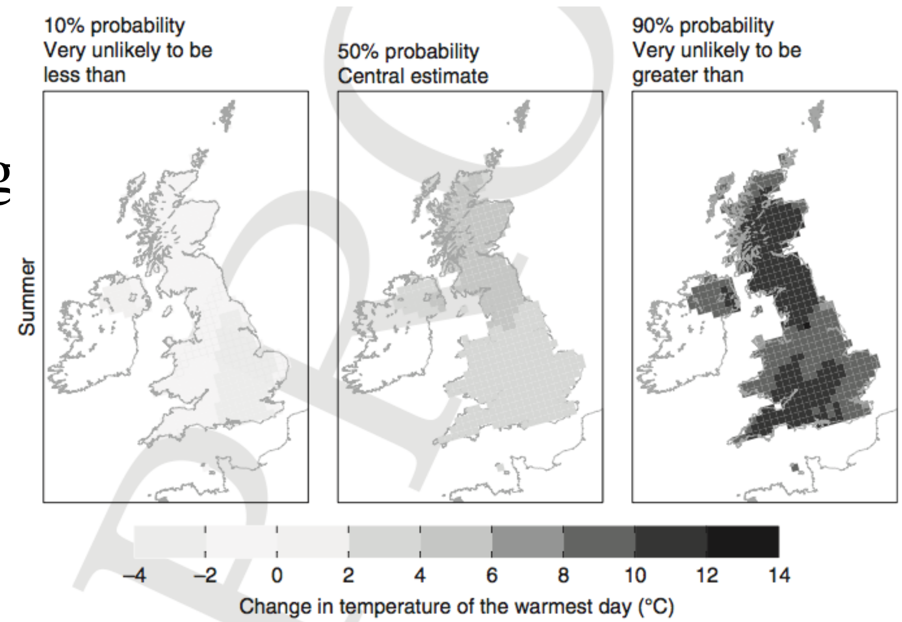
Tamsin Edwards

Global climate model



- **How do we predict future climate change and impacts?**
  - physical models with statistical “add-ons”
  - particular difficulties of extreme weather
- **How should we assess how well models describe reality?**
  - no consensus on best approach
- **Reducing risk**
  - *hazards:* reducing greenhouse g concentrations; geoengineering
  - *vulnerability:* adaptation
- **Challenges of communicating climate change uncertainty**

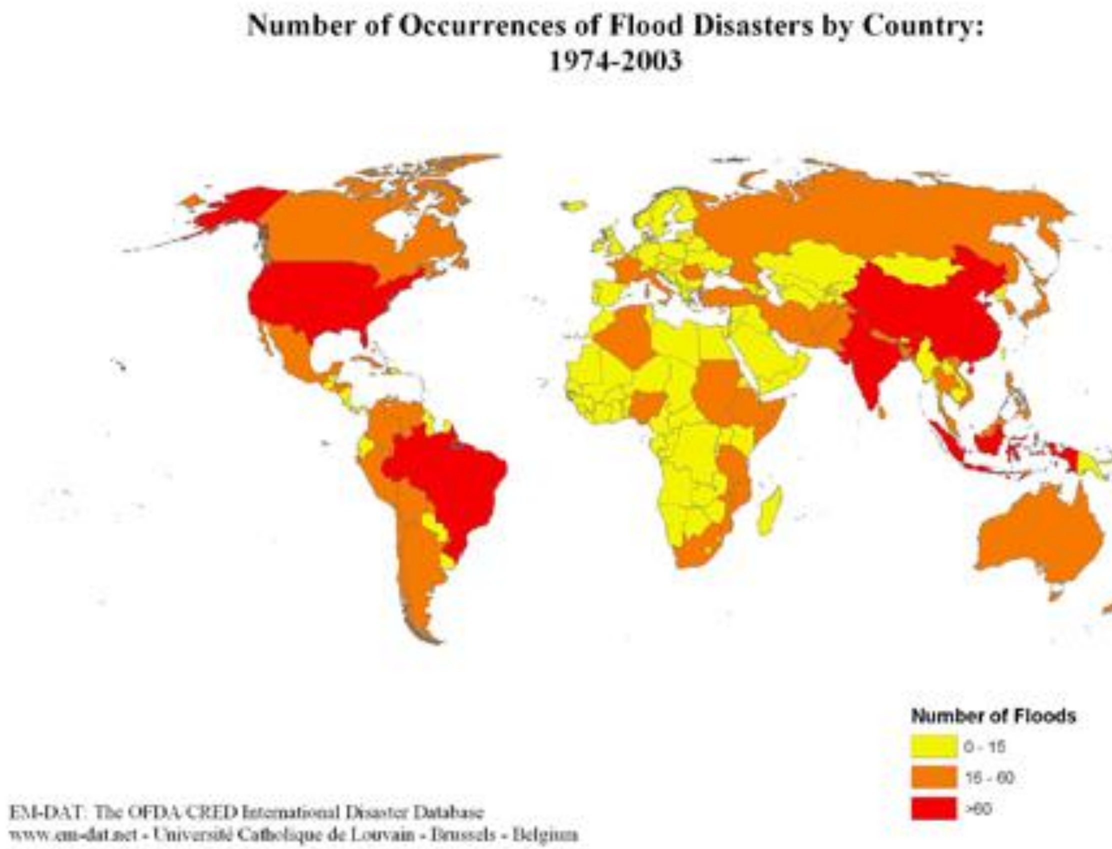
Probabilistic projections



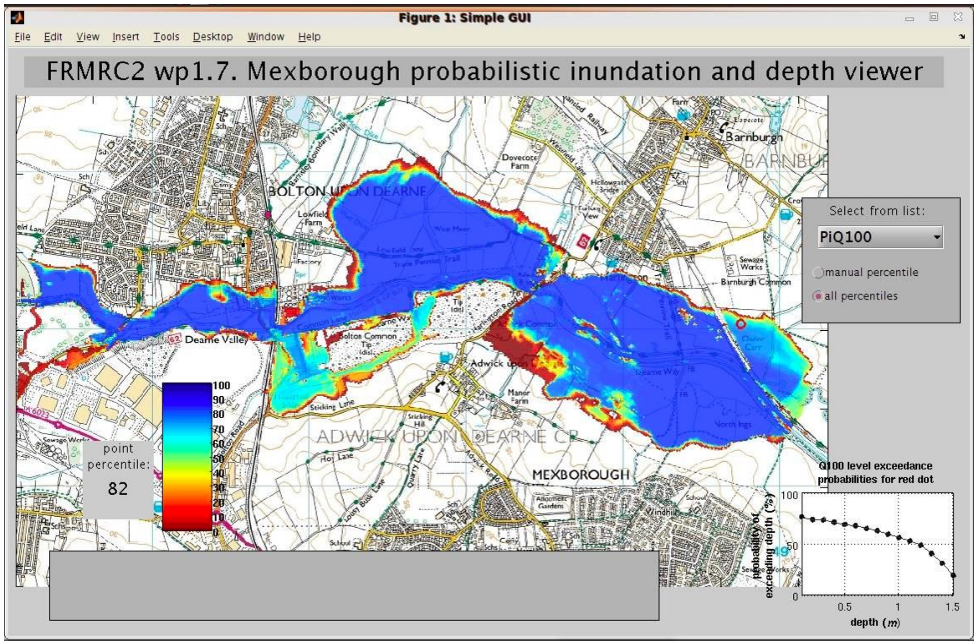
Hydrological flood uncertainty and risk

Jim Freeer, Keith Beven, Jeff Neal, Guy Schumann, Jim Hall, and Paul Bates

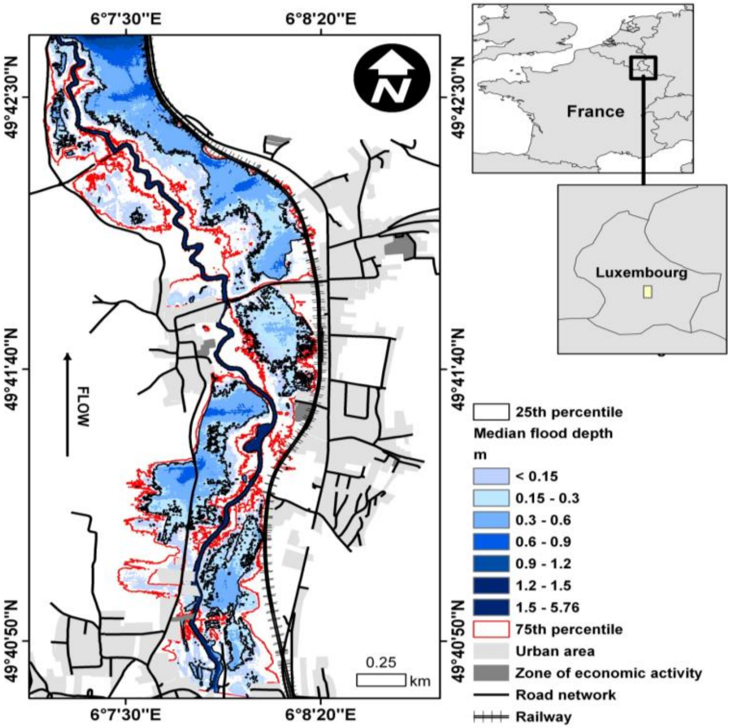
Flood risk – Types, Importance, Current and Future Changes, Climate Change…



Flood risk – Uncertainties, Model Calibration, Mapping, New Technologies, Management Decisions, Future Challenges…



Probabilistic inundation and depth visualisation for Mexborough, Yorkshire. Colours represent the probability of inundation for the AEP 0.01 (T=100 year) event



Flood depth and extent map conditioned on multiple cross-sectional water stages derived from a SAR flood extent of an event that occurred on the Alzette River (modified after Schumann et al. (2009b)).

Some Key Messages: social science

- Insight from the social sciences (theoretical, qualitative, and quantitative) adds to understanding natural hazards risks and uncertainties
- Social science perspectives on risk and uncertainty are NOT add-ons to the physical science needs to be woven into risk and uncertainty assessment from the outset
- Risk research requires knowledge production from diverse actors, including physical, social, humanities, non-academic communities
- Meanings of risk, uncertainty, method, and knowledge change as a result of social sciences in risk research

Some Key Messages: Human Perspectives

Why people live lives in areas of high hazard?
How do they respond to threats and emergencies?

- **Costs and benefits: attachment, community…**
- **Psychology: individual, cultural factors…..**
- **Past experiences**
- **Trust**
- **Politics**

Key outcomes for research and its applications over the next 10 years

Robust and confident forecasting and mitigation strategies; more resilient societies; improved risk management; better and more confident forecasting to avert disaster and to influence policy and regulation decisions; more accurate and digestible information to underpin business and policy decisions; assessment of hazards, their risks likely frequency and attendant uncretainties; comprehensive networks of observations; more robust models; detailed, accessible and interrogatable databases