



UNIVERSITY OF LEEDS

# Peculiarly British? Or The Making of Regional Climate Science for Policy Co-Producing Institutional Cultures and Adaptation Science in the UK

## Project ICAD

Advancing Knowledge Systems to Inform Climate Adaptation Decisions

James Porter [j.j.porter@leeds.ac.uk](mailto:j.j.porter@leeds.ac.uk)

School of Earth and Environment, University of Leeds, UK.

*Confidence, Credibility & Authority in Climate Science & Politics, Paris, 2014.*



**UNIVERSITY OF LEEDS**

- Principal Investigator: Prof Suraje Dessai
- PostDocs: Dr James Porter & Dr Geoff Whitman
- Funded by a European Research Council (ERC) Starting Grant under the domain of Social Science & Humanities (Environment and Society panel; SH3)
- €1.045 million grant spread over 4 years (1 April 2012 – 31 March 2016)

<http://www.icad.leeds.ac.uk>

# Signposts

- ***UK Climate Projections: UKCP09***

- **What are climate projections?** How are they used? By whom, and why?

- ***Geographies of Science***

- How does the **place** affect the **conduct** and **content** of climate science?

- ***British Climate Science***

- How, and in what ways, does **structure, culture, and policy-context** affect the production of climate science?

- ***Example: Quantifying Uncertainty***

- What does UKCP09's approach to tackling **uncertainty** tell us about wider **institutional politics**?

**Which crops?**



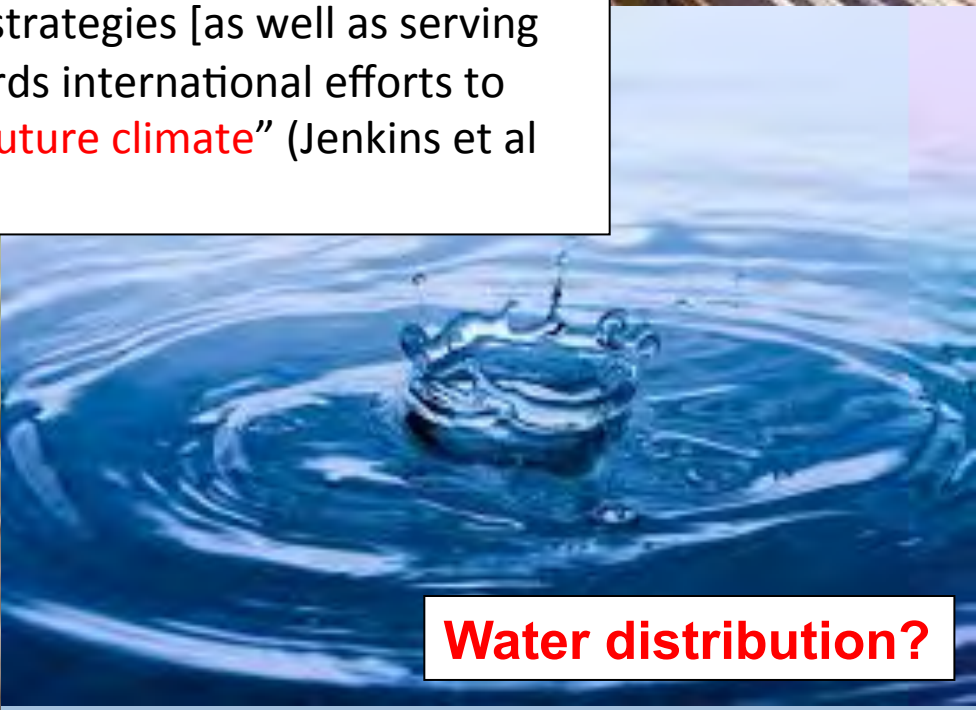
**Stress tolerance of road surfaces?**



These climate projections offer “**support for decision makers** who need to plan adaptation strategies [as well as serving as] a **major contribution** towards international efforts to improve our **ability to model future climate**” (Jenkins et al 2009: 2).



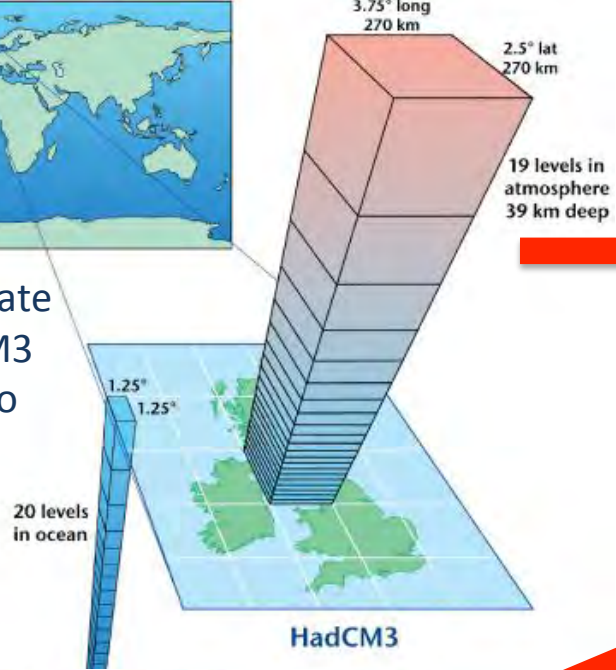
**Rails buckling?**



**Water distribution?**

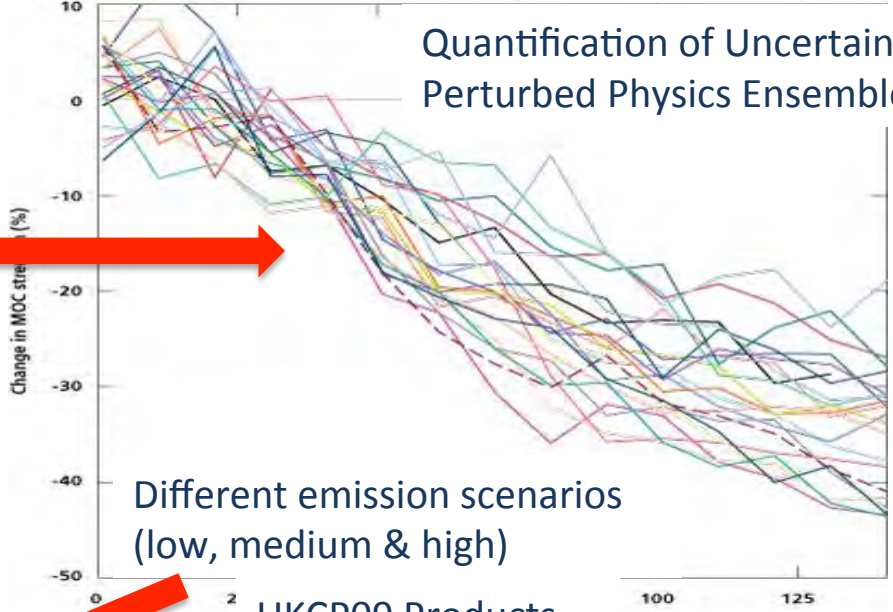


Regional Climate Model HadCM3  
Downscaled to 25KM



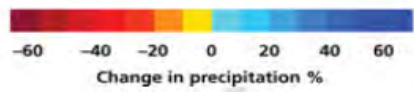
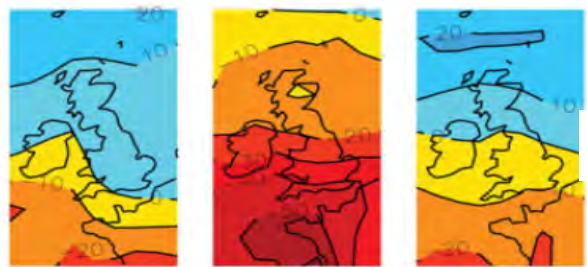
HadCM3

Quantification of Uncertainty  
Perturbed Physics Ensemble (PPE)



Different emission scenarios  
(low, medium & high)

UKCP09 Products



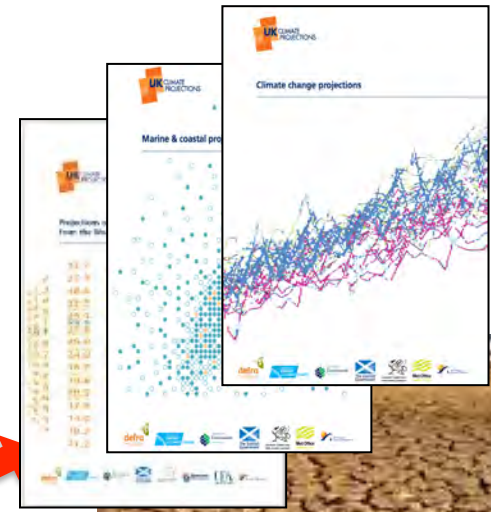
Winter 1.5m T (°C)  
Wales



- Timescaling
- Internal variability
- Carbon cycle
- Structural uncertainty
- Parameter uncertainty

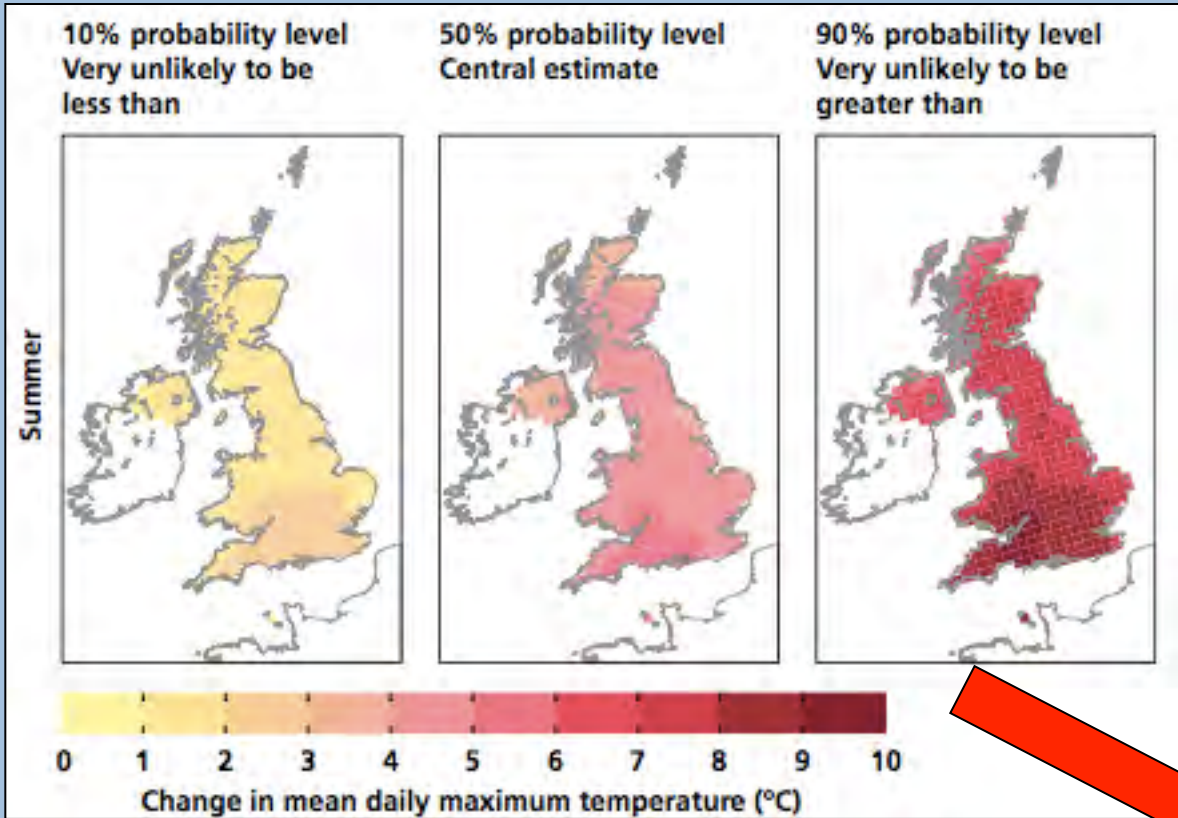
Emulator to fill in gaps

Quantifying different sources of uncertainty

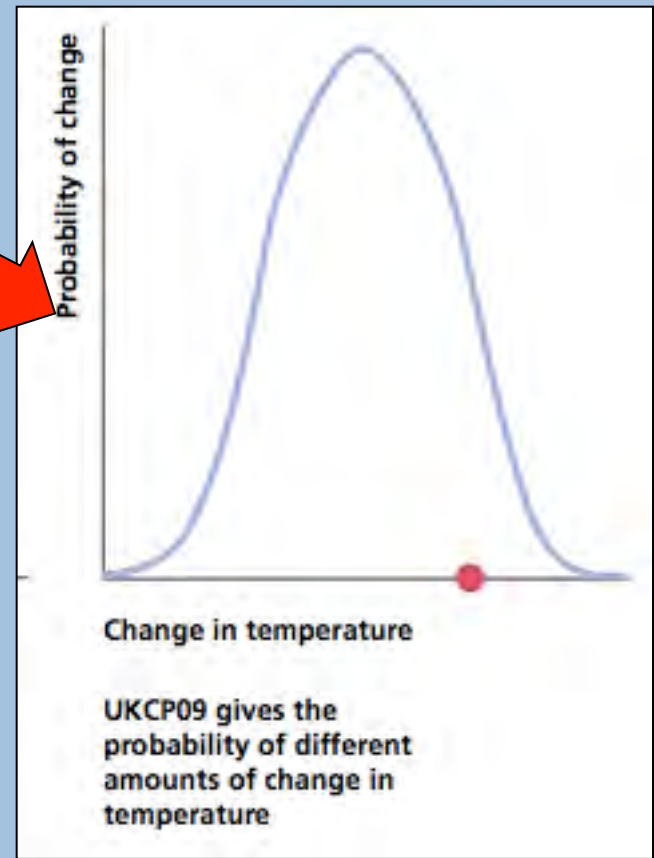


To avoid this?





- Climate projections of temp, rainfall etc up to 2100
- High-resolution 25km (Oxford & London)
- 3 emission scenarios (low, medium & high)



“Probability in UKCP09 can be seen as the relative degree to which each climate outcome is **supported by current evidence**, taking into account our understanding of climate science, observations, and expert judgement” (Jenkins et al 2009: 6).

# Geographies of Climate Science



# Organisation of British Climate Science

Three broad characteristics of British climate science:

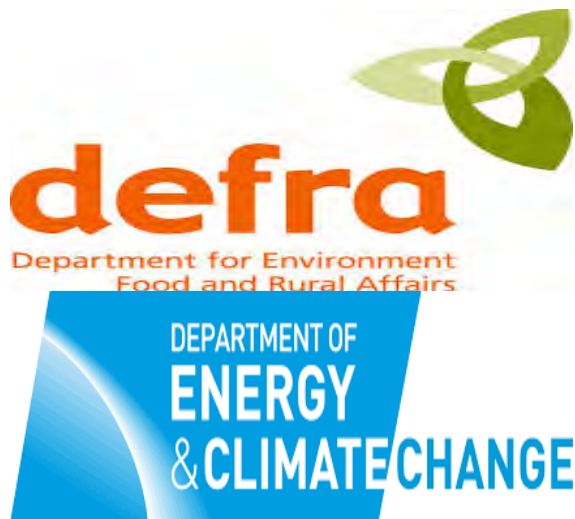
1. *Policy-Need*. Single, large, government contract to Met Office to be world-leading and feed into the IPCC, international negotiations, and UK plc.
2. *Smallness*. Met Office Hadley Centre alone constitutes the main focus of climate modelling, directed use, and contrast to US where competition is normal.
3. *Conservative*. Activist-scientist who finds a niche in the US is less welcome, seen as trouble-maker, alarmist, and politically motivated.



# Policy Needs

Met Office Hadley Centre, national source of scientific inputs on climate to the wider research community and government departments as well.

Policy needs expressed through a single, large, government research contract, for state-of-the-art, climate projections to inform IPCC.



UK climate science and policymaking are very much intertwined.

Policy-objectives, defined by leading scientists, research managers, and government officials, take precedence over individual or organisational motivations.

Science-policy conducted behind closed doors.

# Community Connections

Small, centralised, structure of UK climate science - close relationship with the Natural Environment Research Council.

Met Office staff sit on review panels, committees and act as research partners.

Academic scientists hold multiple policy duties.

Small user community – Climate Change Act 2008 (e.g. water companies).

Pluralistic funding situation in US encourages healthy competition modelling centres – greater diversity.



**NATURAL  
ENVIRONMENT  
RESEARCH COUNCIL**

# Reticence: Erring on the Side of Caution



Prof. Michael Mann

Don't "be fooled by the smoke and mirrors" used by climate sceptics to "discredit" the IPCC's latest report, singling out the "career fossil fuel-industry apologist Bjorn Lomborg" and "serial climate disinformers Judith Curry", who misled the public through "the usual purveyors of climate change misinformation: Fox News, the editorial pages of the Wall Street Journal and various conservative tabloids..." (Mann 2013).

"we don't know all the details but we do know that by adding these greenhouse gases at the rate we are, we are playing a **incredibly dangerous experiment with our one planet**. We only have **one planet** and we may be incredibly lucky but the chances are we won't be" (Hoskins 2011).



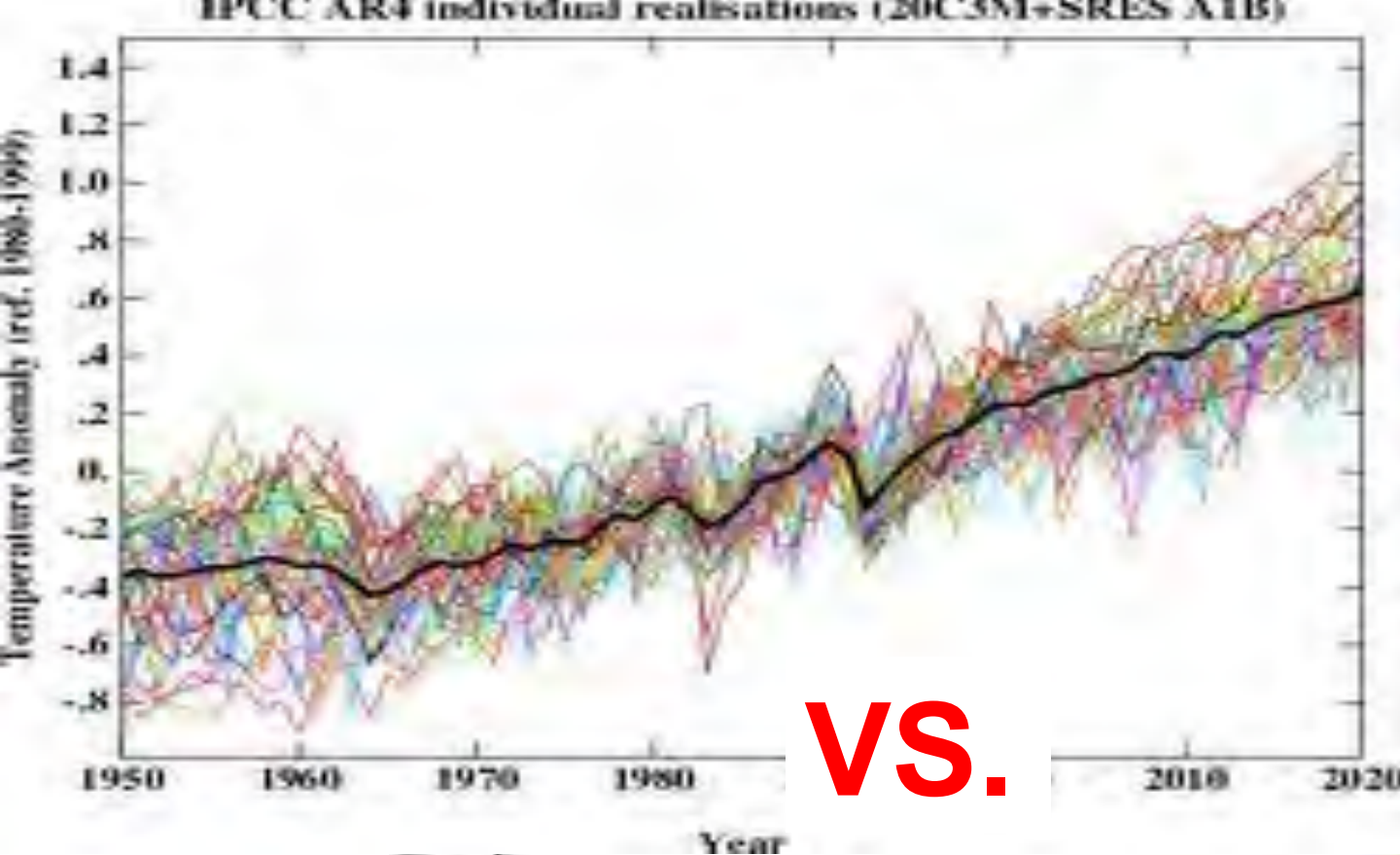
Prof. Sir Brian Hoskins

# Organisation of British Climate Science

Three broad characteristics of British climate science:

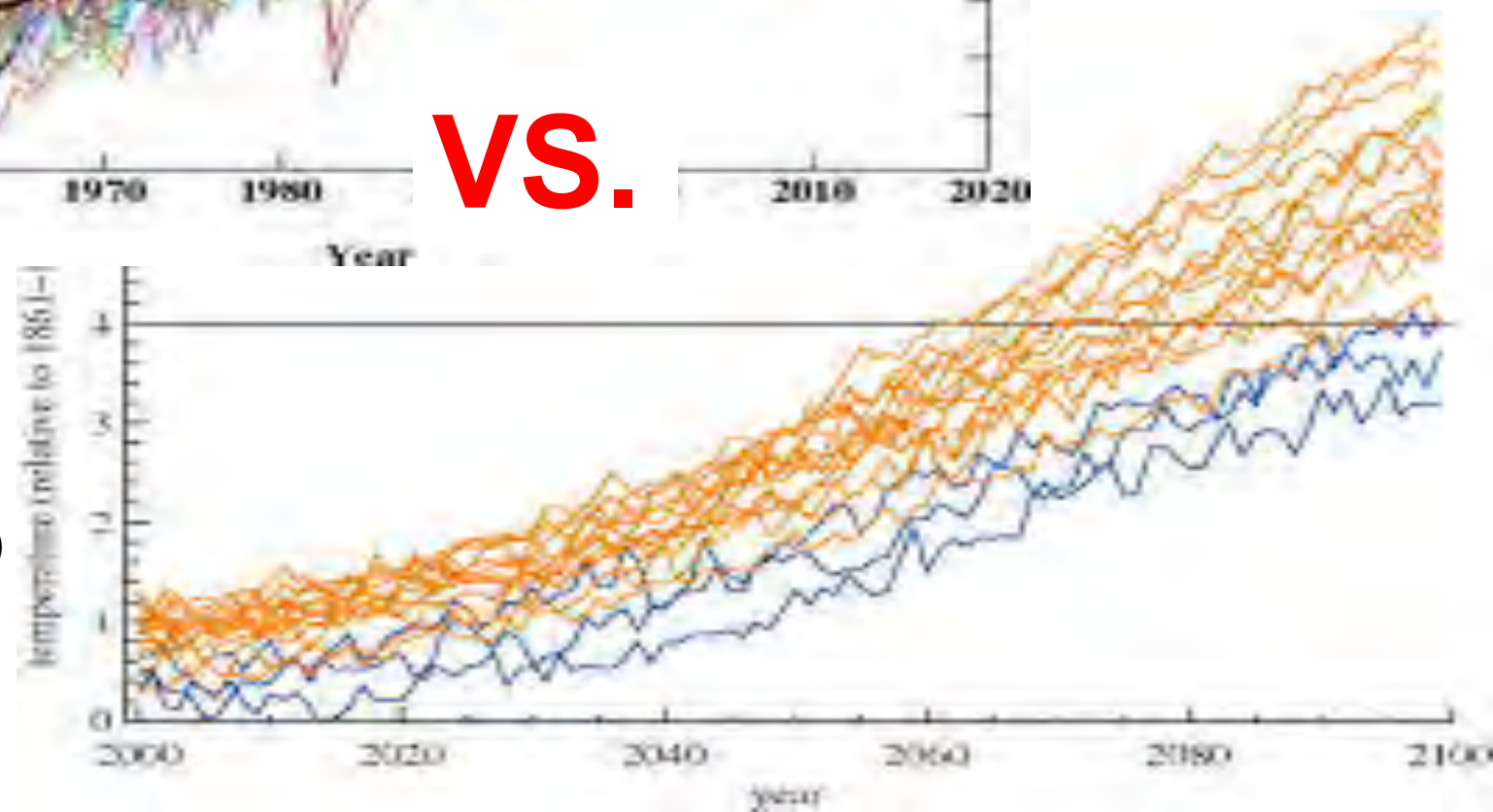
1. *Policy-Need*. Single, large, government contract to Met Office to be world-leading and feed into the IPCC, international negotiations, and UK plc.
2. *Smallness*. Met Office Hadley Centre alone constitutes the main focus of climate modelling, directed use, and contrast to US where competition is normal.
3. *Conservative*. Activist-scientist who finds a niche in the US is less welcome, seen as trouble-maker, alarmist, and politically motivated.

# Example: Quantifying Uncertainty



**Multi Model Ensemble (MME)**

**Perturbed Physics Ensemble (PPE)**



# For PPE and MME think cars!



# How to Quantify Uncertainty?

MME, where more than one climate model is used, was discounted because:

“20 different models will produce 20 different answers” (Met Office Climate Scientist 5 – Interview)

Not all models use the same dynamic equations, inclusion/exclusion of some processes, different parameter values, spatial resolutions, hardware

Institutional-political considerations as well:

“A major strength of the Met Office Hadley Centre’s reputation is its unified model and the inclusion of other models can raise awkward questions about why don’t we pay more attention to the American, Canadian, French, or Swiss models?” (Met Office Climate Scientist 12 – Interview).



# How to Quantify Uncertainty?

PPE, multiple versions of the same model are used, became the preferred choice.

Complex, state-of-the-art, climate models contain hundreds of uncertain parameters introducing computing demands:

- Processing time on the supercomputer too expensive
- Computing resource shared with other staff
- Only a limited number of simulations possible with the rest filled in with a statistical emulator

“having a Rolls Royce of a statistical method but fitted over a Fiat engine” (Met Office Climate Scientist 8 – Interview).

Is the uncertainty captured reliable and robust enough for decision-makers (Frigg et al 2014)?

# Quantifying Uncertainty: Responses

“from a method point of view the goal just seemed *right* and it was something that *should be done*. [What] really gives me confidence is the Bayesian framework, it has been used in other fields by proper statisticians. Okay we put our own interpretation on it... because it's a bigger problem... but its all written down in the maths; its there to debate... *its just good science*” (Met Office Climate Scientist 3 – Interview).

- World-leading, objective/accountable, and original science

“they did very good work, fantastic technological thing, conceptual and statistical whatever. It was fantastic – *c'est magnifique* – but it doesn't necessarily mean that's *what you should do*” (Academic Climate Scientist 2 – Interview).

- Policy objectives effect on the credibility and utility of climate science for decision-making

# Dissent and Conservatism

Reservations were held, privately, within the science community about this method: so why didn't they speak out?

Open, frank, exchanges about what constitutes good, usable, useful science published in the New Scientist were ignored

Cultural preference for conservatism:

“the way [these scientists] presented their arguments probably didn't help. They can be *quite confrontational*... and the impression is that the Met Office pushed ahead regardless of what was being said” (Academic Climate Scientist 7 – Interview).

Small community: effect on future funding prospects in speaking out.

Risk being labelled a climate denier.

# Climate Denier?

“Back in 2007 Judith Curry said, ‘we have to be really careful about what we attribute to climate change and what is climate variability, which we don’t understand’... We don’t understand everything in the models, we don’t understand the oceans, we don’t understand this or that, so there are many things that we’re attributing to climate change that might not be a result of climate change... But she was accused of being a denier... It’s a very reasonable thing to say... from a scientific point of view... but apparently you risk your reputation if you’re too vocal about it” (Academic Climate Scientist 1 – Interview).

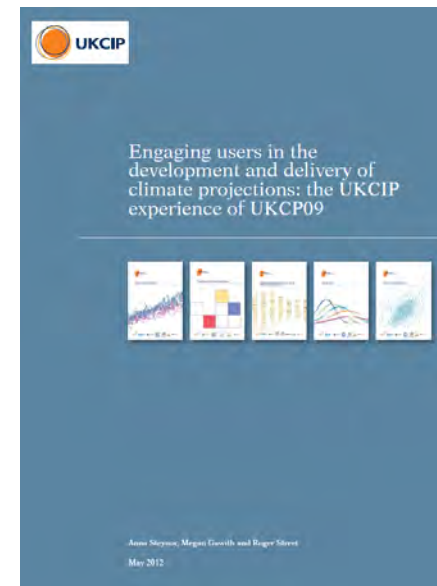
- Small, conservative, hierarchical, culture for producing climate projections in Britain at the expense of organised scepticism?
- Peer review of sorts...

# Decision-Making & Uncertainty



‘If modellers are asked for detailed forecasts about what will happen say in a corner of England in 2080, some feel, and I’m thinking of those in the Met Office [Hadley Centre], that’s its their job to provide an answer. And whatever the computers spits out, they feel obliged to report it, even if they have reservations about the results’ (Academic Climate Scientist 6 – Interview).

- Do policymakers/users’ **need** uncertainty to be **quantified** or it was constructed this way?
- **Cultural considerations** around, and resistance over, **responsibility** for interpreting probabilistic information
- Transparency, accountability and standardisation fail to work because the science is **too complex** and **opaque**



# Geographies of Science

- Does place matter in the construction of climate projections?
- Three peculiarly British characteristics for doing climate science: policy-needs; small, hierarchical and centralised setup; and conservative culture
- Practical considerations on the choice of uncertainty method were shaped by wider socio-technical and institutional-political considerations as well
- This affects who does this work, how they do it, and responses to it.
- Context, and content, shape and reshape each other

# Thank You!

## Any Questions?

**Contact details:**

Dr. James Porter

Centre for Climate Change Economics and Policy

Sustainability Research Institute

School of Earth & Environment

University of Leeds

[j.j.porter@leeds.ac.uk](mailto:j.j.porter@leeds.ac.uk)