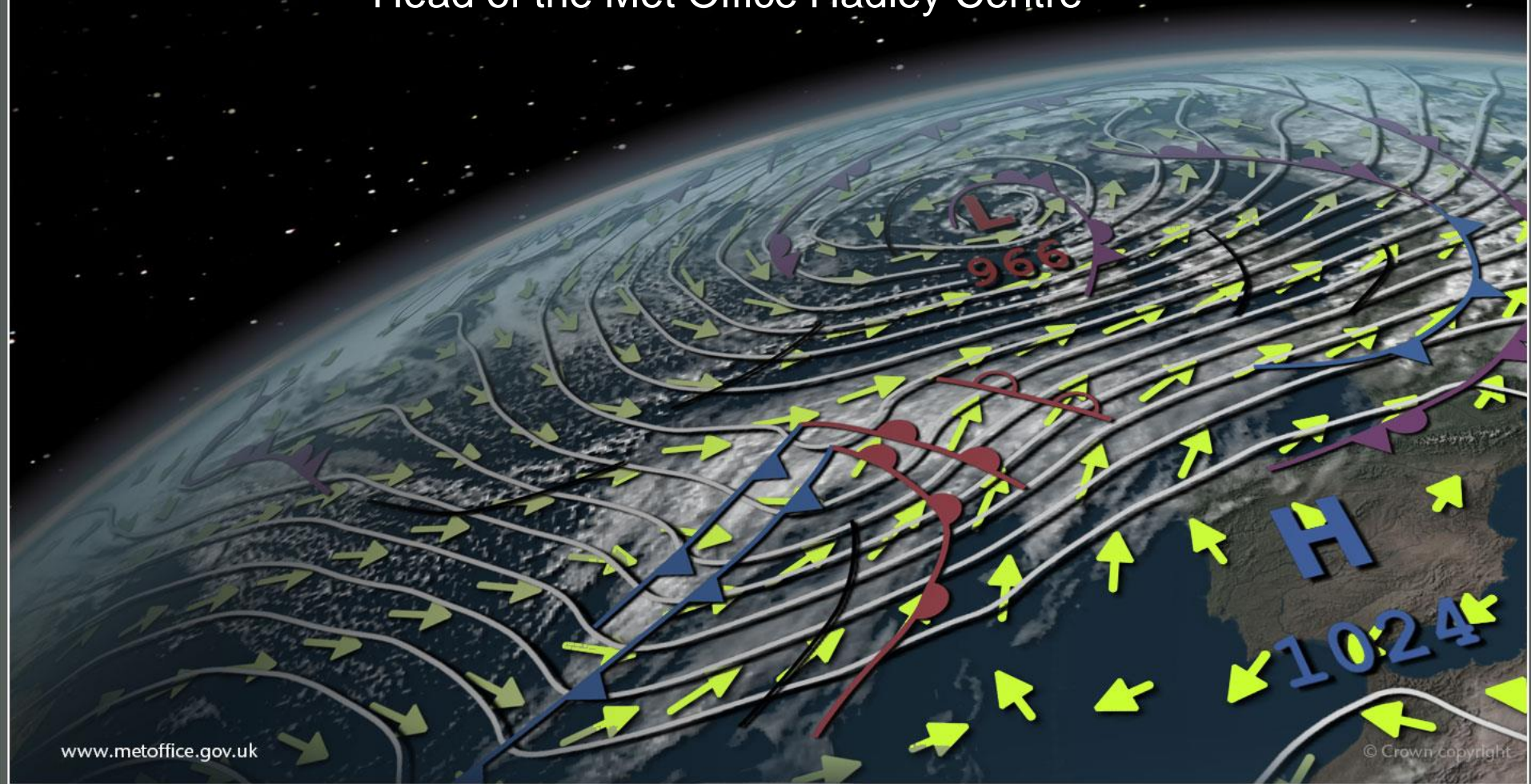




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# Multi-decadal projection systems: Experience in the UK

Professor Stephen Belcher  
Head of the Met Office Hadley Centre



# UK Climate Information

## UKCP02: First bespoke climate projections for the UK

- HadCM3, and regional modelling at 50km resolution
- Three future periods, 4 emission pathways
- No quantification of uncertainties

## UKCP09: probabilistic projections

- Moving from uncertainty to probability
- Perturbed parameter ensemble (PPE)
- Regional downscaling at 25km resolution
- Changes to 30 year means

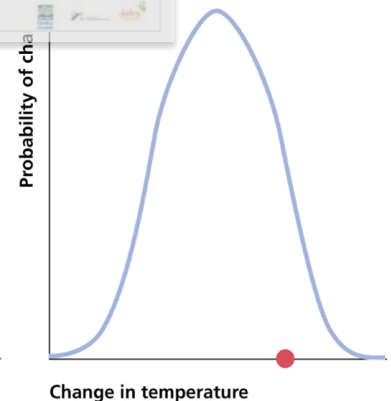
## UKCPnext ...



UKCP02 gave a single estimate of change in temperature



Using many models would give a range of different changes in temperature, but no information on which to use



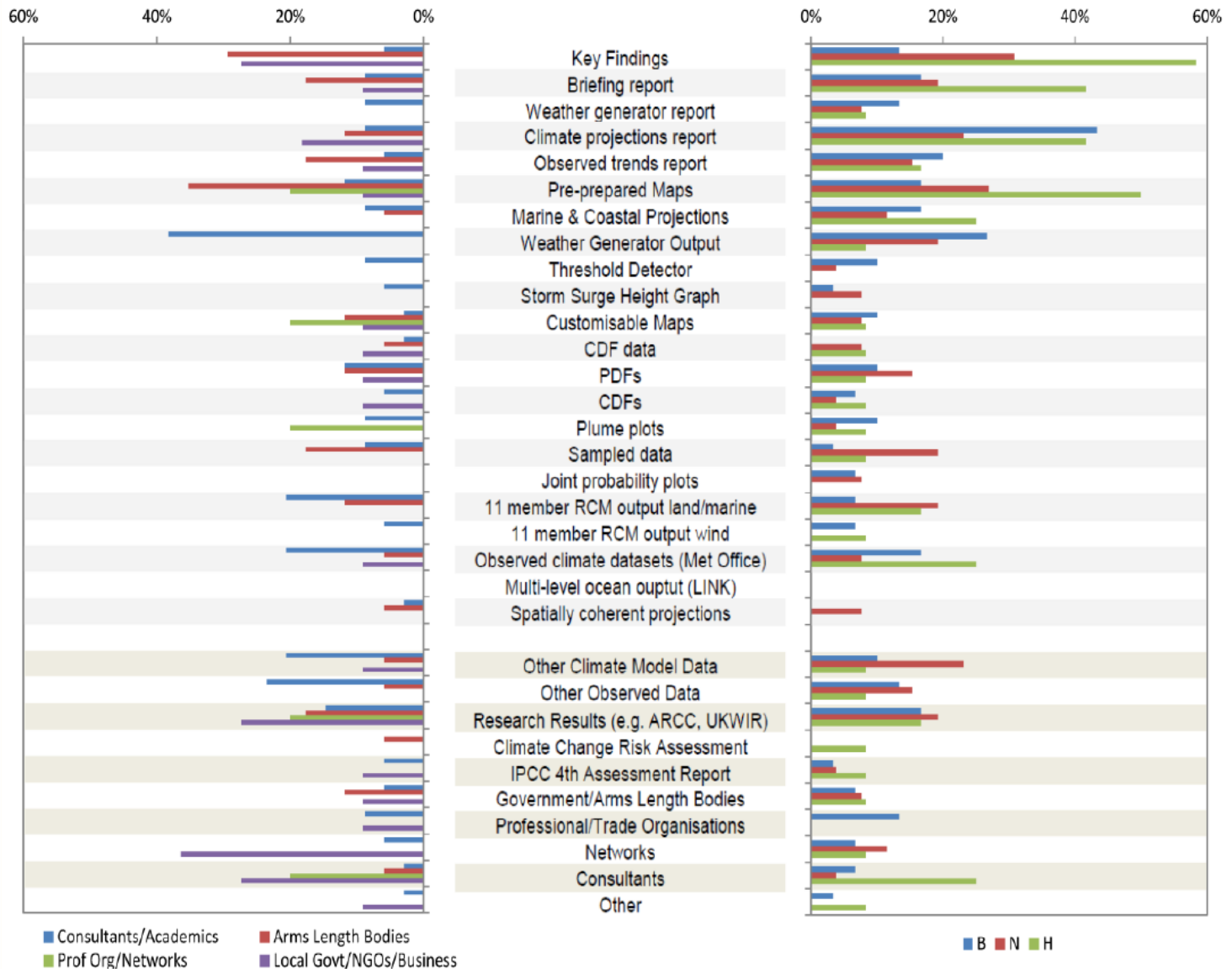
UKCP09 gives the probability of different amounts of change in temperature





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# User workshops...



# User requests for UKCPnext

- Retain robust assessment of uncertainties
- Retain consistency of information (e.g. across time scales)
- *More information for next few decades*
- *More information on extremes*
- Provide a simpler and more flexible basis for decision-making: an ensemble of realisations of future variability and change with full spatial and temporal coherence
- Keep up to date e.g. align with IPCC

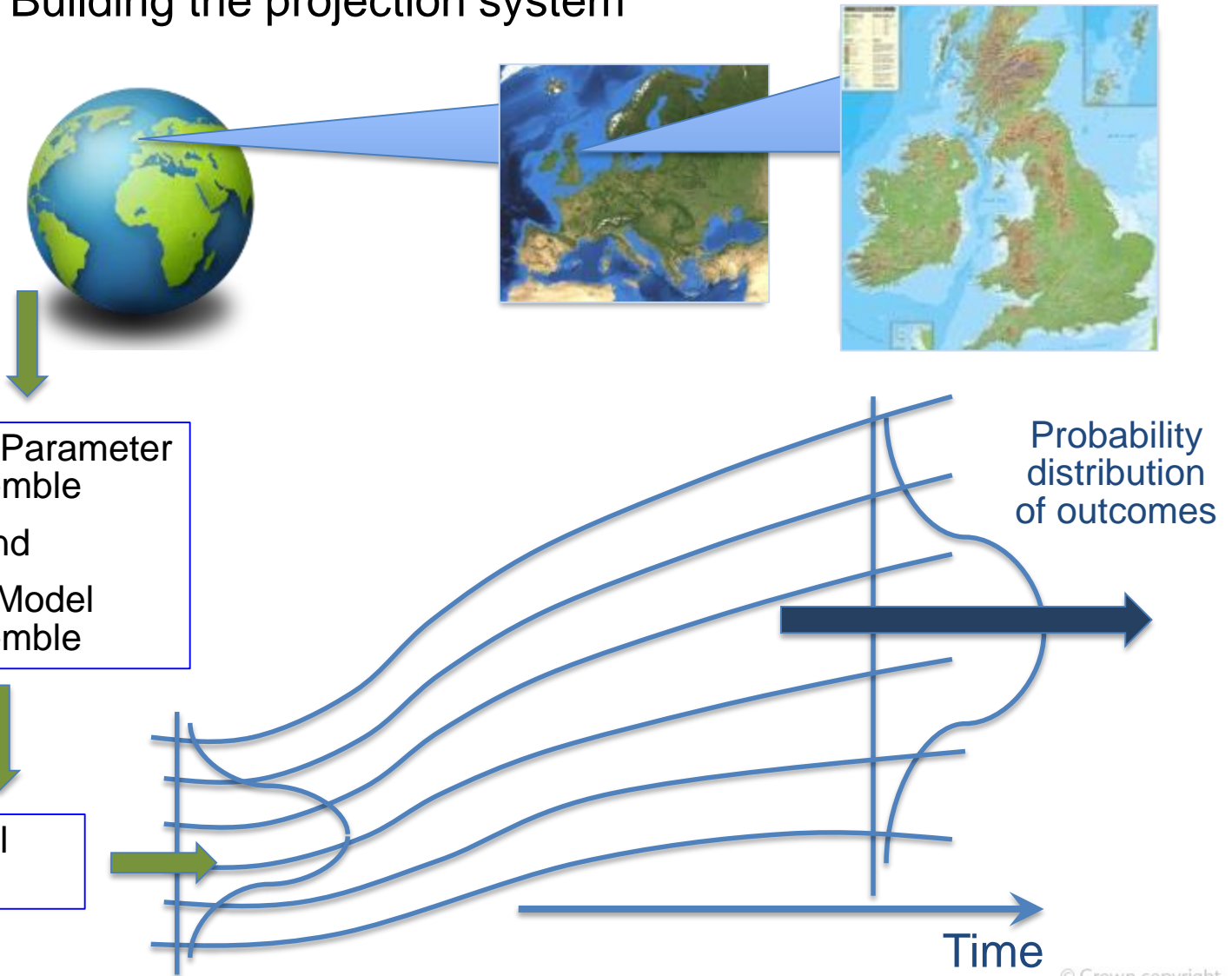
## **UKCPnext: Scientific developments**

- Blend together PPE and MME
- New global model for climate extremes
- Convection permitting downscaling for high impact weather



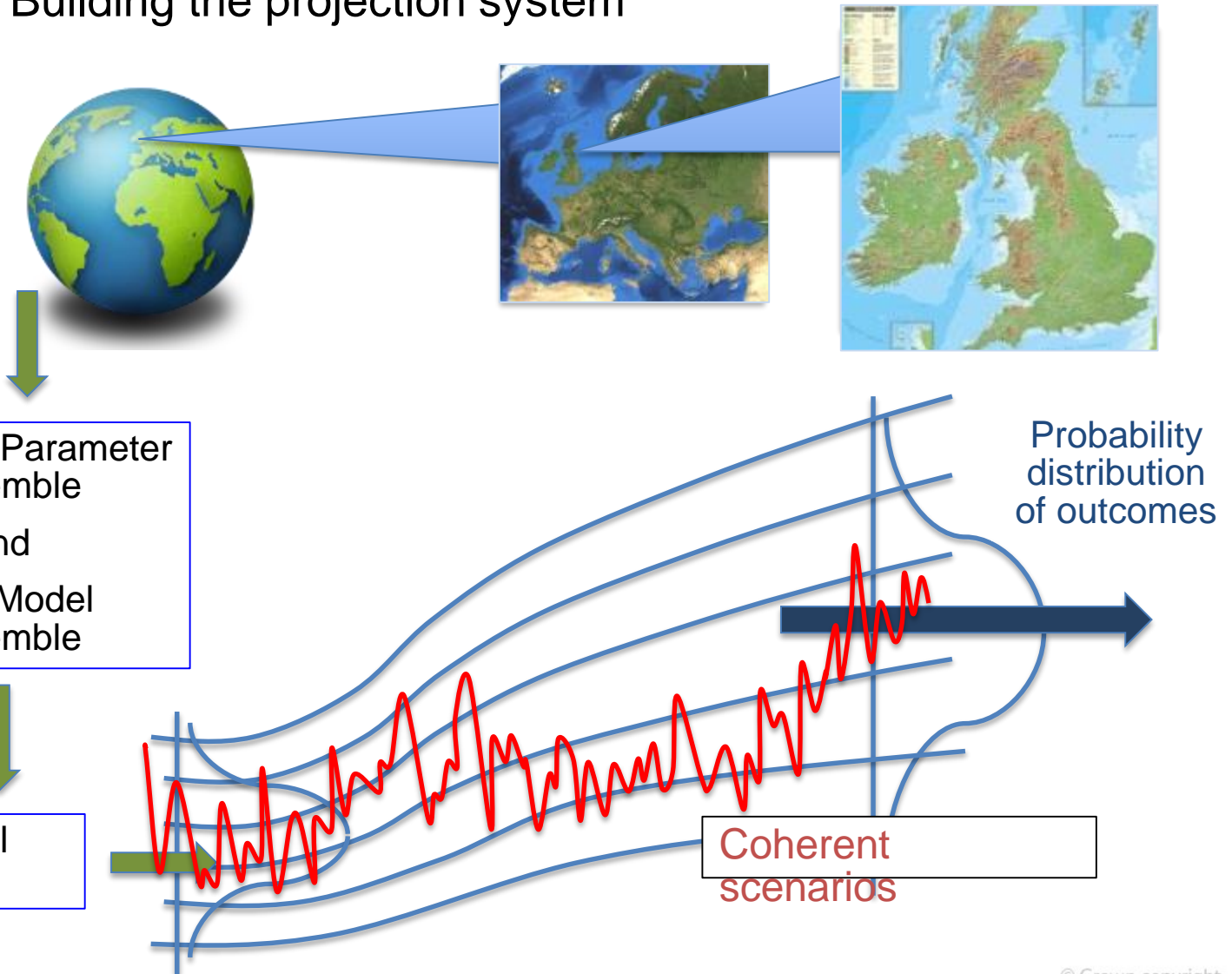
# UKCP

Building the projection system



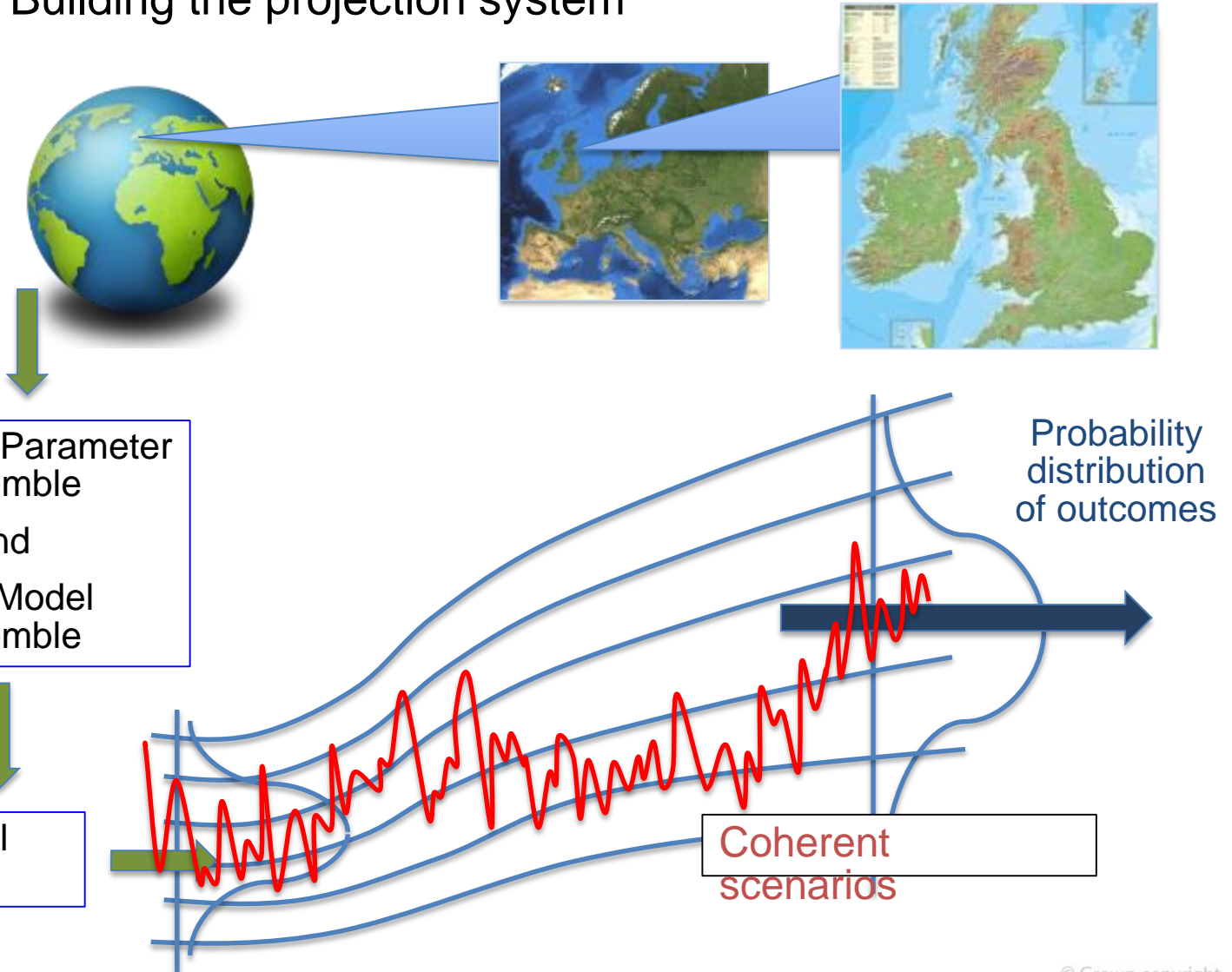
# UKCP

Building the projection system



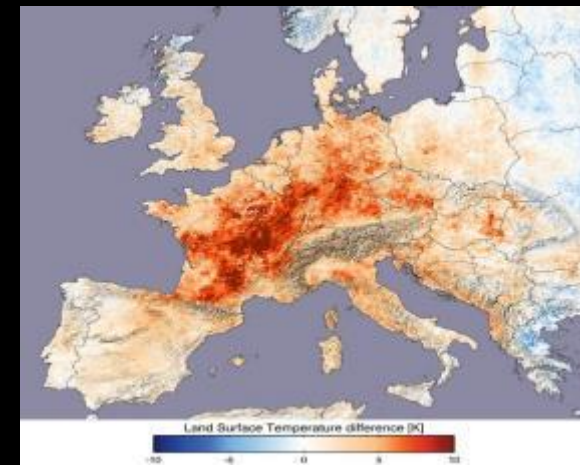
# UKCP or EUCP?

Building the projection system



# Extremes I: Climate Events

## European summer 2003



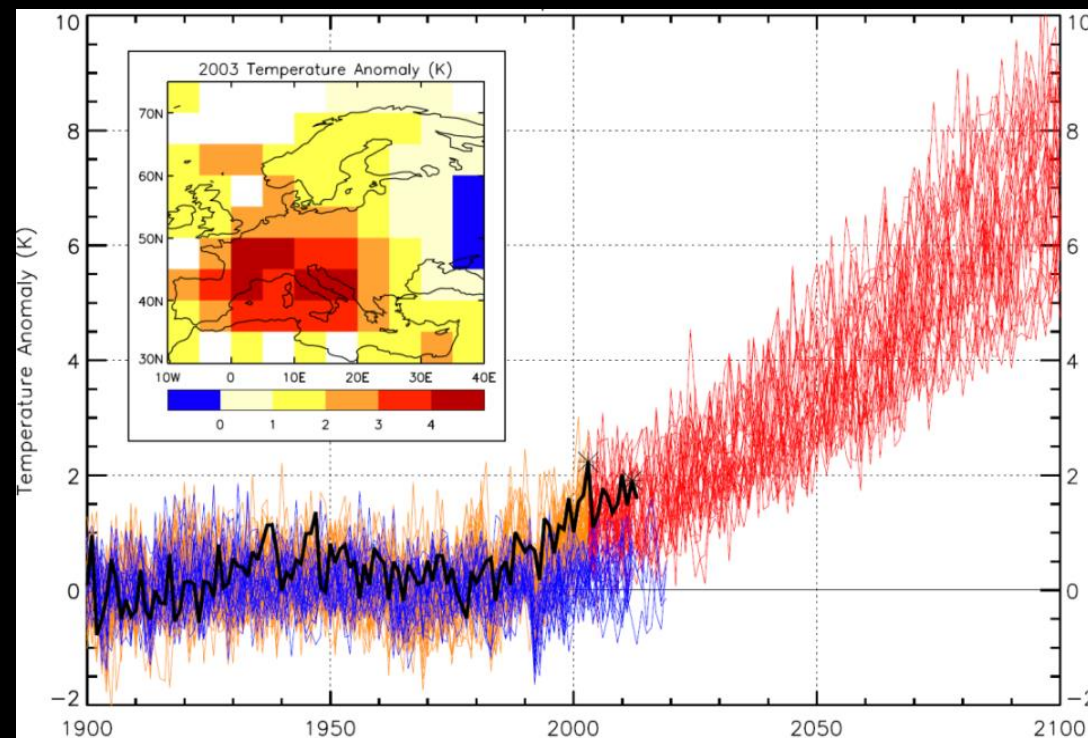
### The climate context

Conventional message:  
*Climate change will bring  
more hot dry summers to  
Europe*

2004 assessment:

Odds of 2003 temperatures  
doubled in greenhouse world

Heatwaves that would be  
expected to occur twice a century  
in early 2000s now expected twice  
a decade

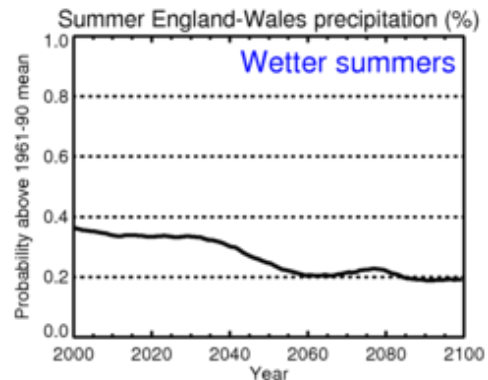
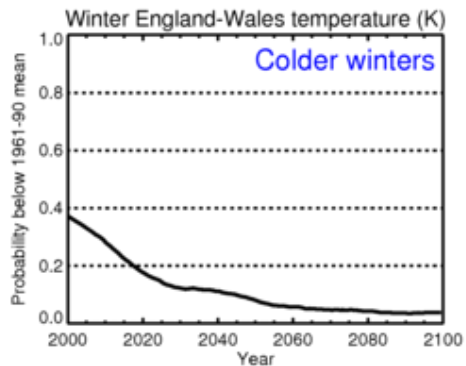
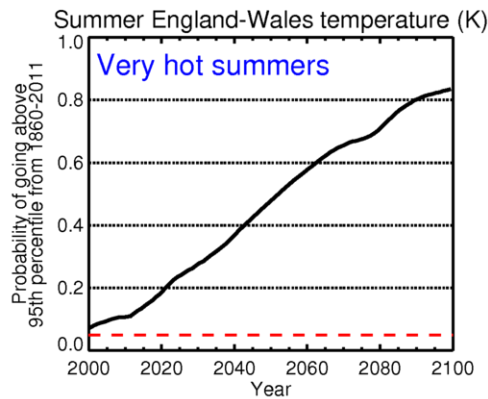
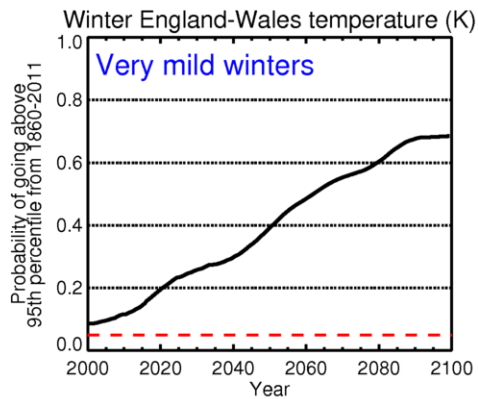






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# Changing extremes



By 2100:

Very hot summers increase 20-fold

Very wet winters increase six-fold

But:

35% chance of wet summer until 2040s

20-30% chance of cold winters until 2020s

Sexton & Harris (2013)

# Extremes II

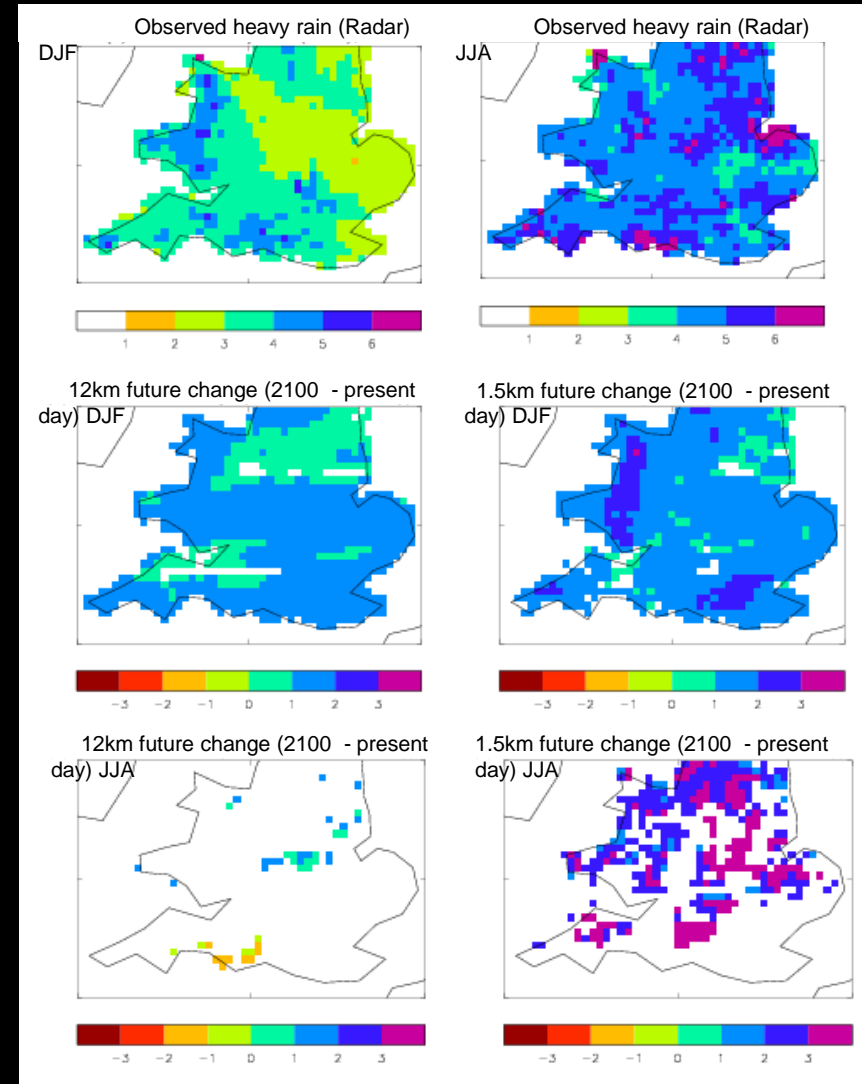
## *high impact weather*



### Adaptation agenda:

- Flooding
- Urban drainage
- Soil erosion

*Kendon et al., 2014: Nature Climate Change*





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## Summary

- Different users require different information
- Plans for UKCPnext
  - PPE + MME
  - Climate extremes
  - High impact weather
- Opportunity for EUCP?

