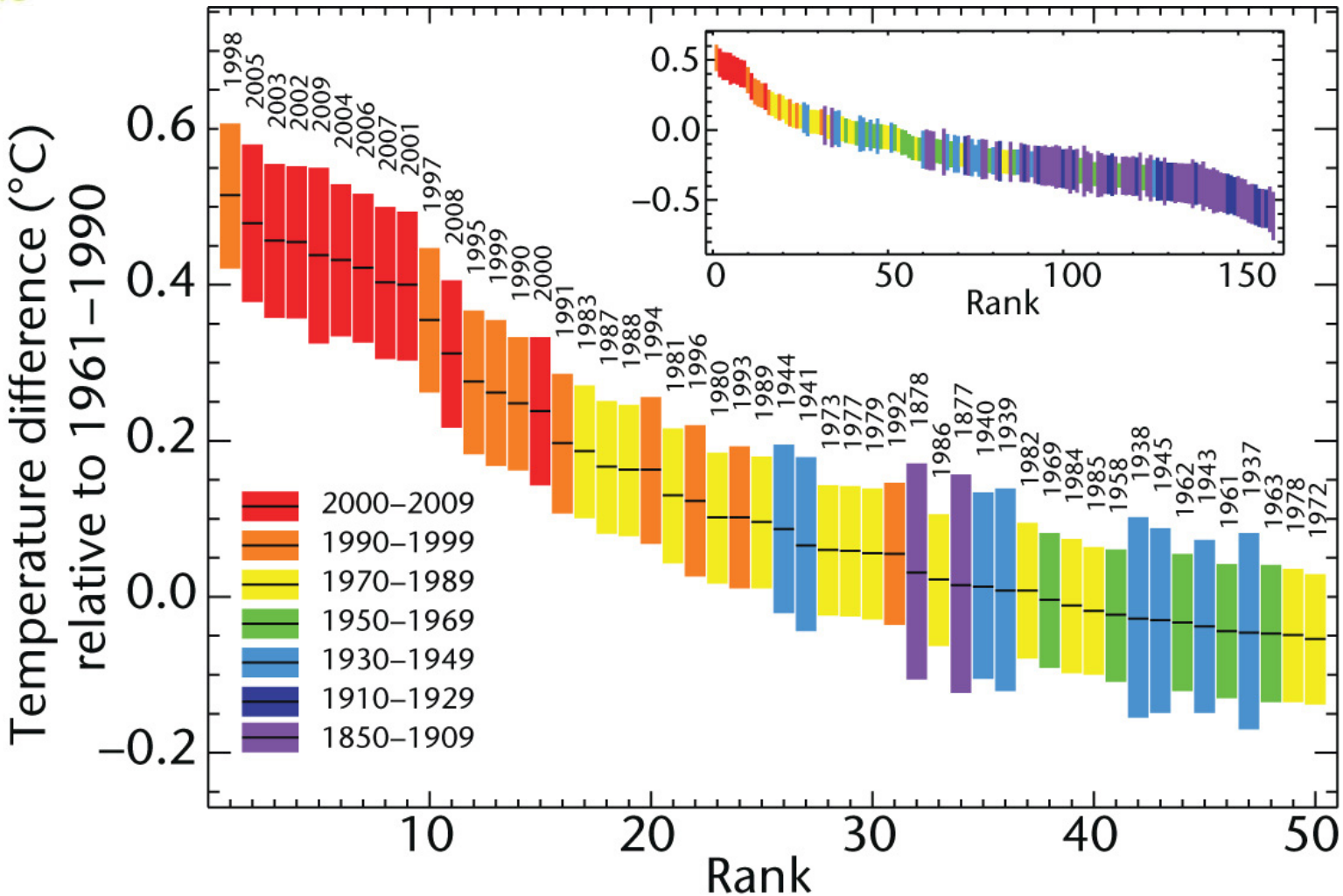
Met Office
Hadley Centre

Science
Driving our response to climate change

Dec 2009

Global ranked temperatures (HadCRUT) show a definite warming trend



Climate models are used to make projections of future climate

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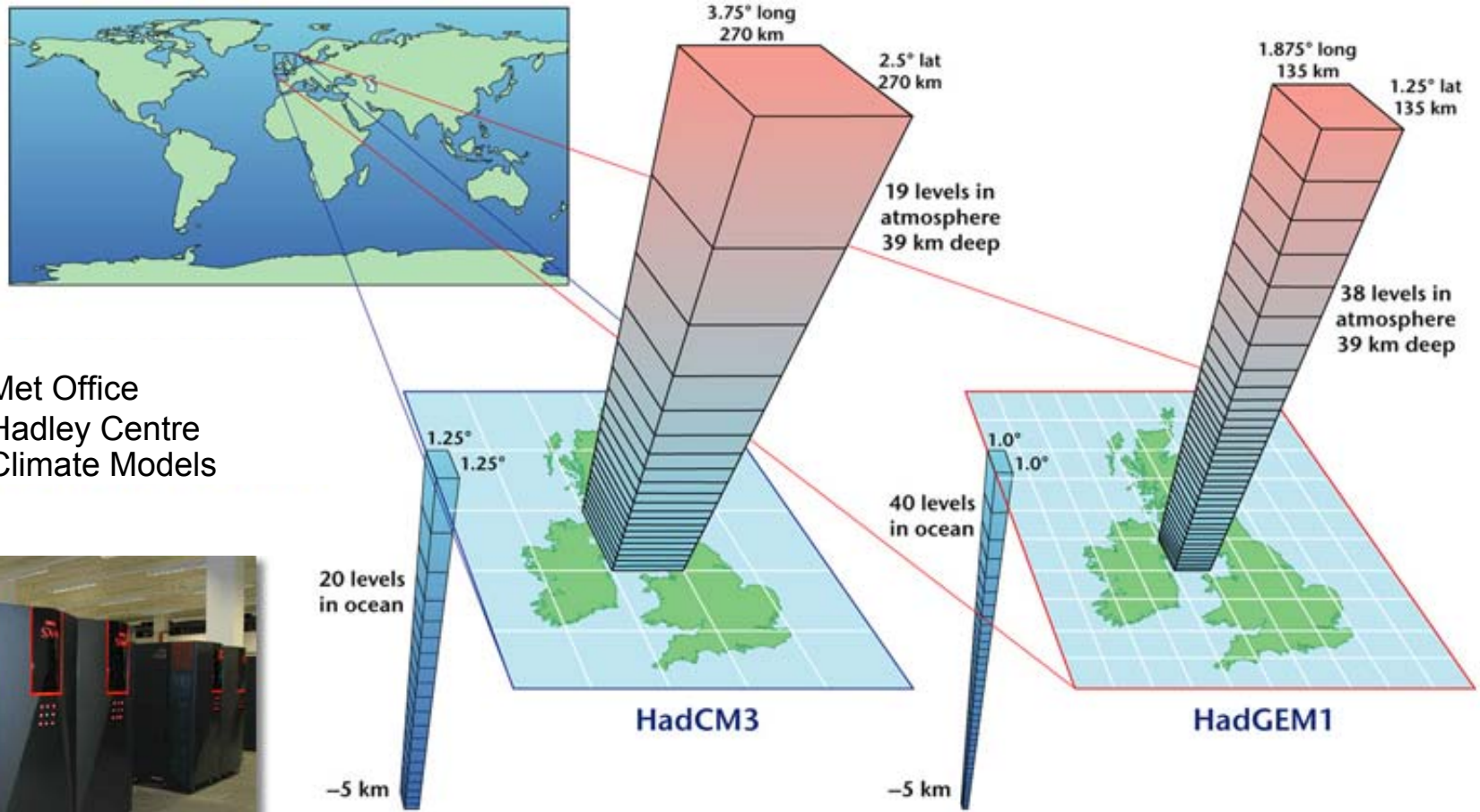
Climate Models



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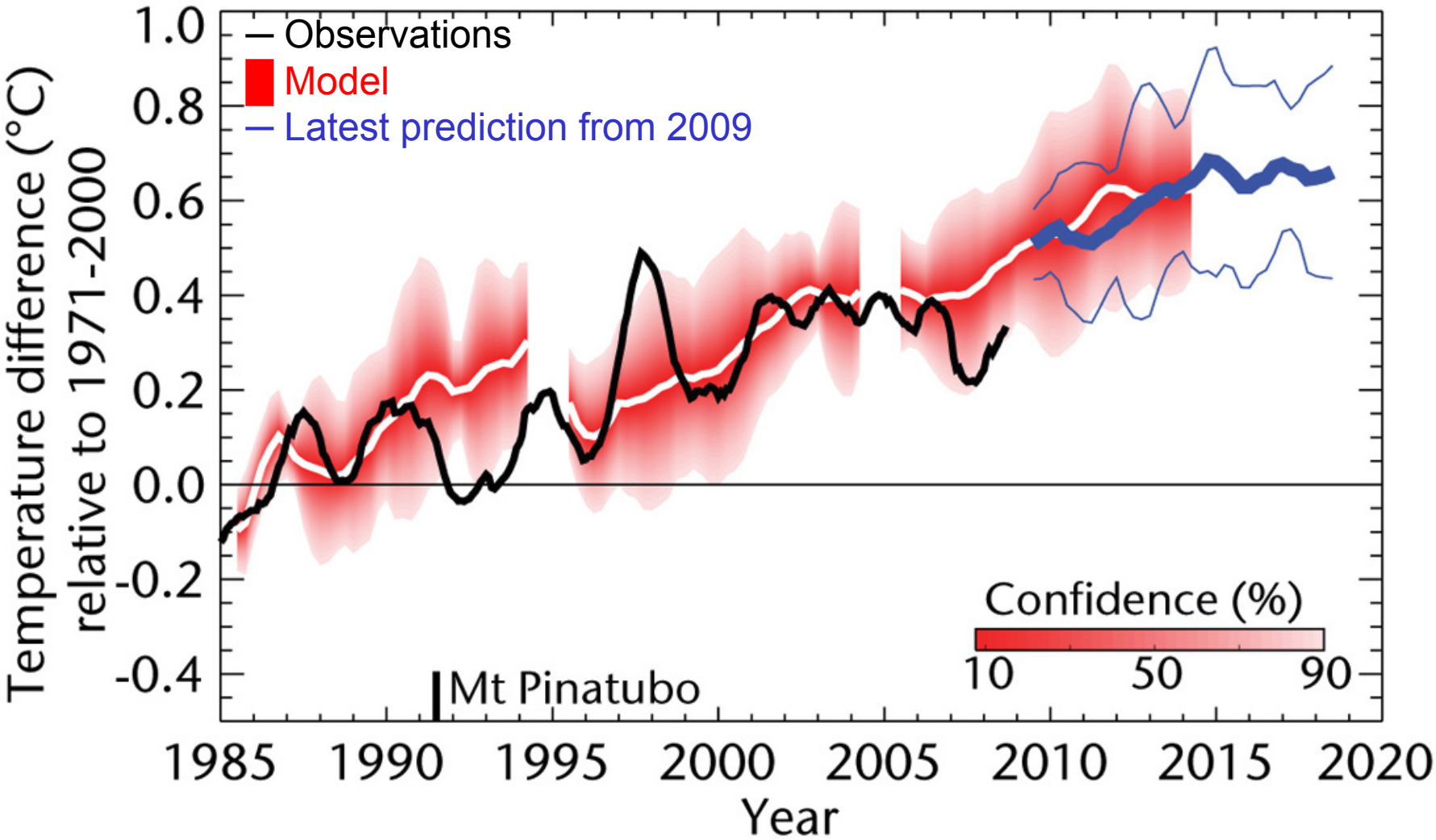
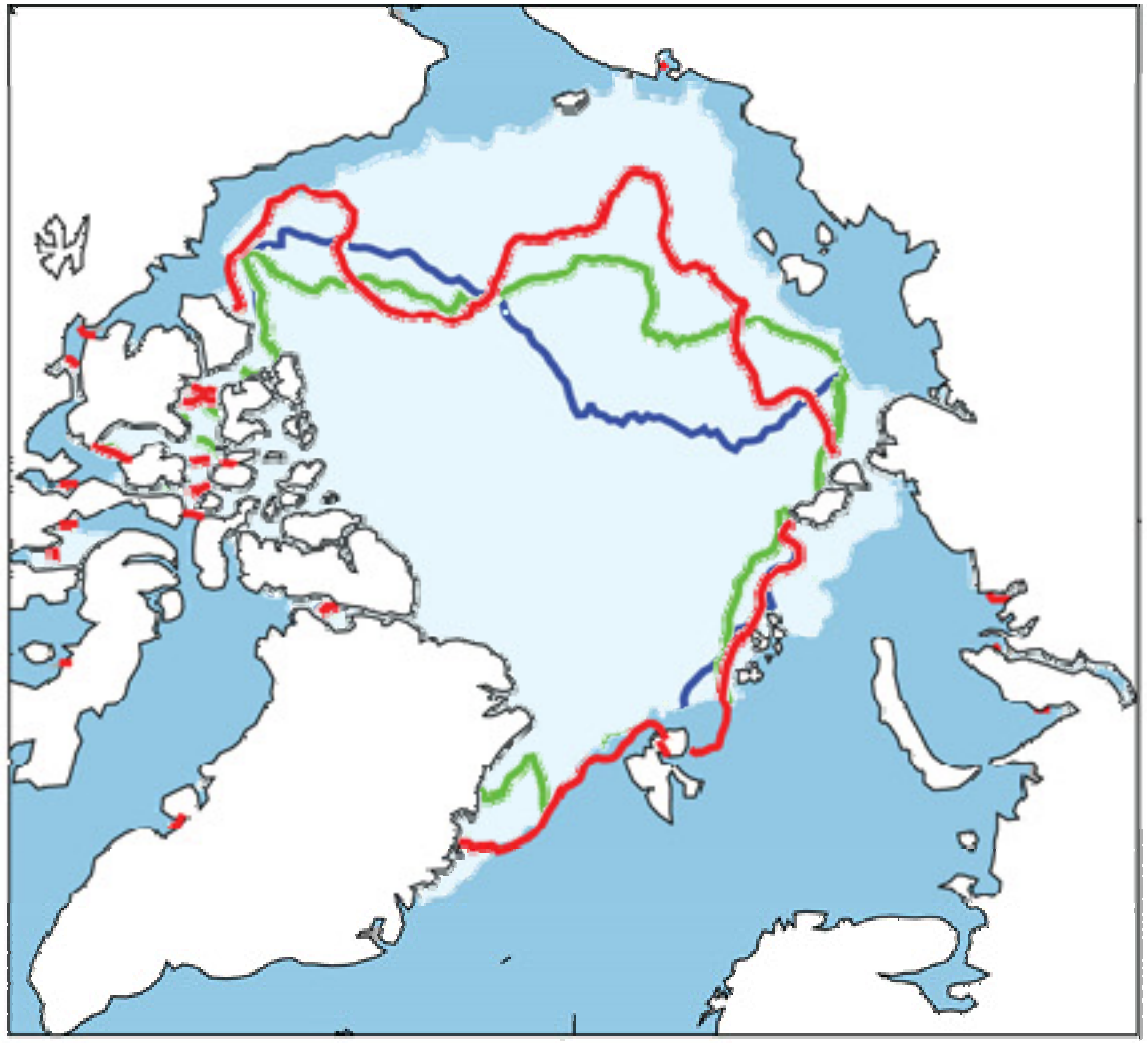
Global average temperature forecast predicts half of all years in the next decade could be warmer than the 1998 record.



Following the Arctic summer sea-ice minima in 2007, ice extent has begun to recover

There is a long term declining trend



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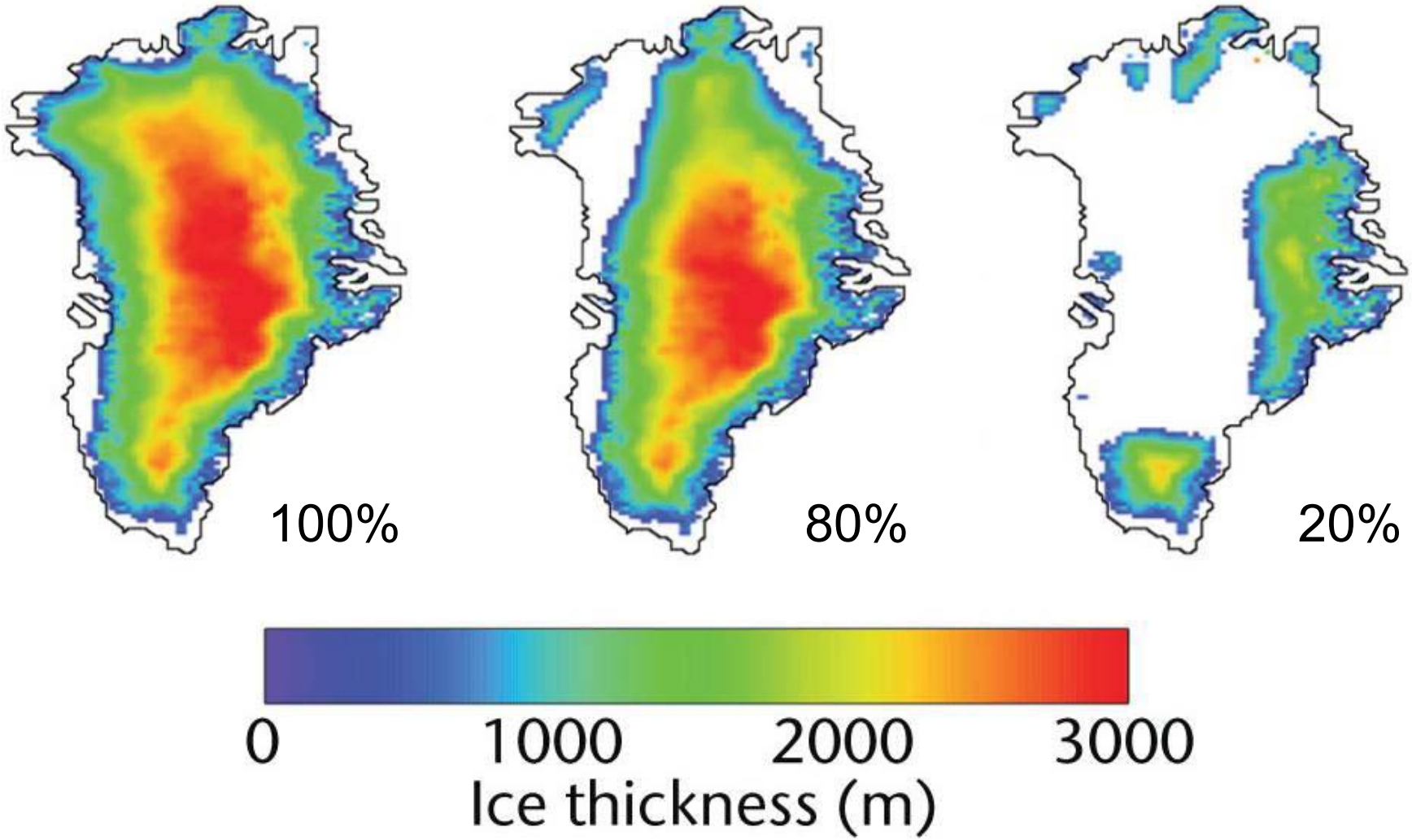
Dangerous climate change
New evidence of commited change

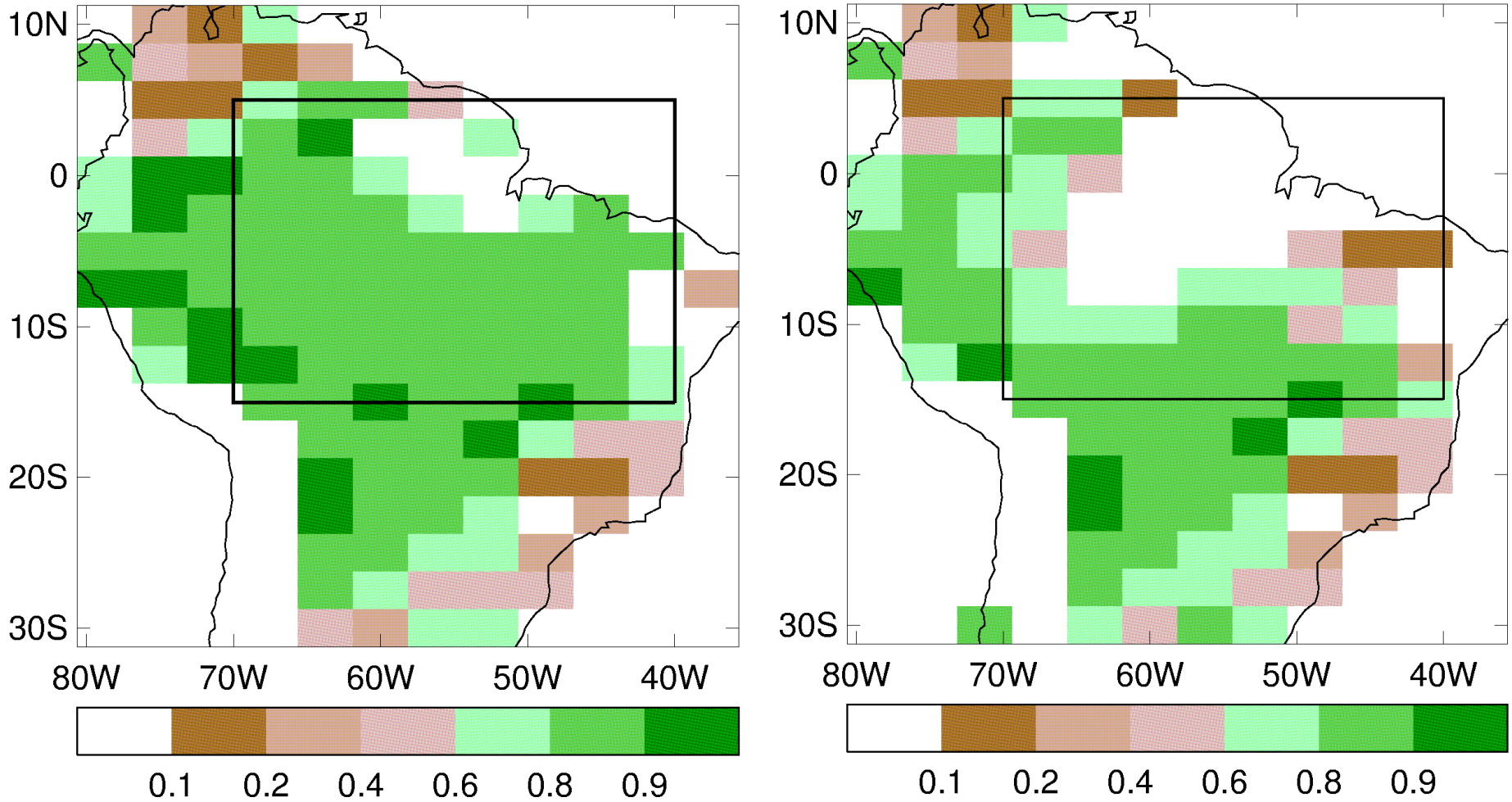
Melting of the Greenland ice sheet could be irreversible, with three stable states identified



Even before Amazon starts to die we could be committed to significant loss of forest

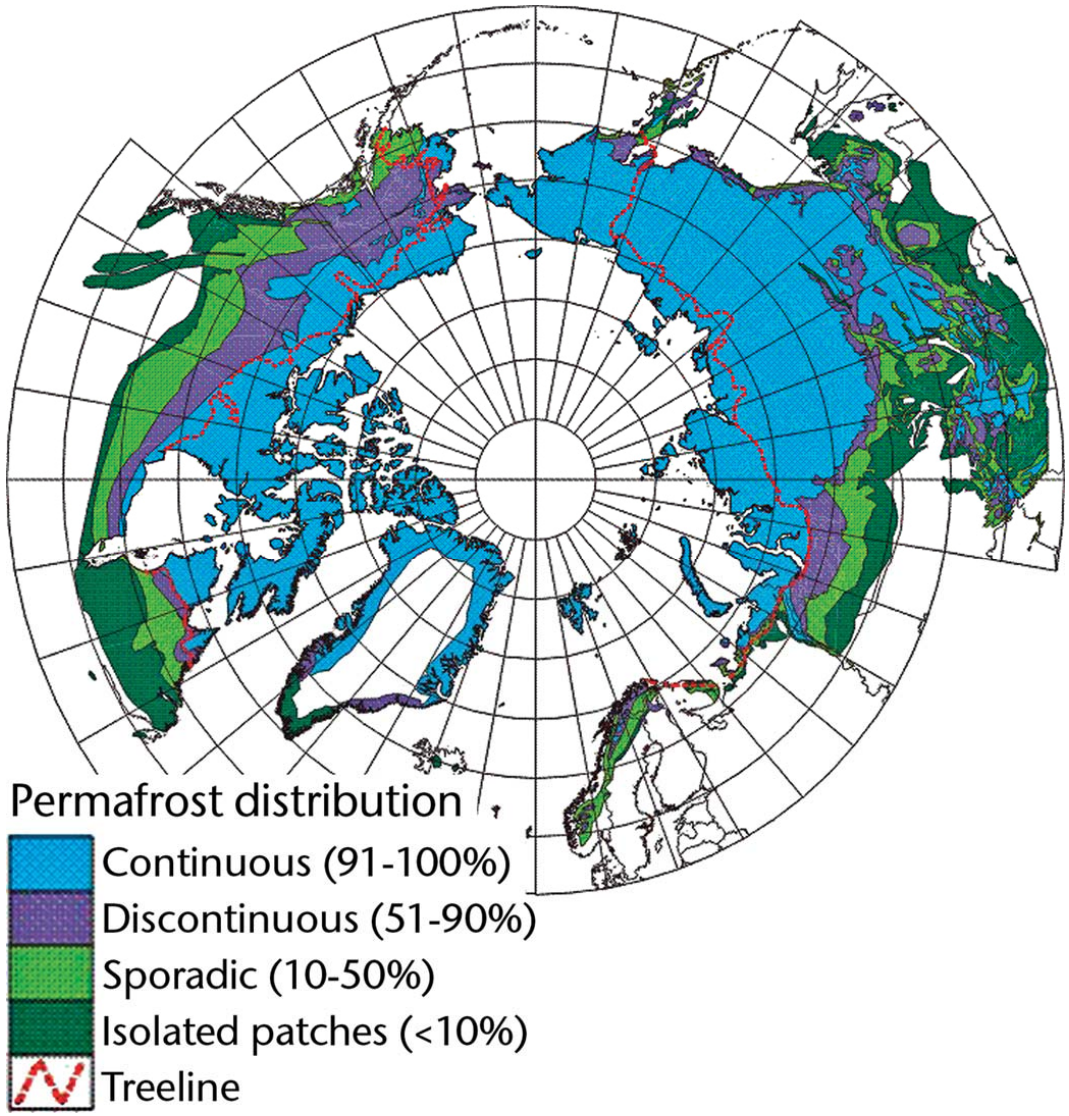
Forest when temperature rise reaches 2ºC in 2040

Forest when temperature stays at 2ºC for 100 years



Methane release

- Arctic ocean
  - Methane hydrate may become unstable by 2100 in the Barents Sea
  - Committed change as heat takes a long time to reach ocean bed
- Permafrost
  - Thawing and drying or permafrost could give rapid release of methane or CO_2



Tarnocai et al., 2009. © AGU

Ocean acidification

- Increased CO_2 causes ocean acidification
- Threatening marine species throughout the food chain such as
  - Plankton
  - corals and crustaceans
  - disrupting marine ecosystems
- Increasing sea temperatures also threaten marine life
- More acid ocean less able to absorb further CO_2 accelerating climate change

The impact of a global temperature rise of 4 ºC

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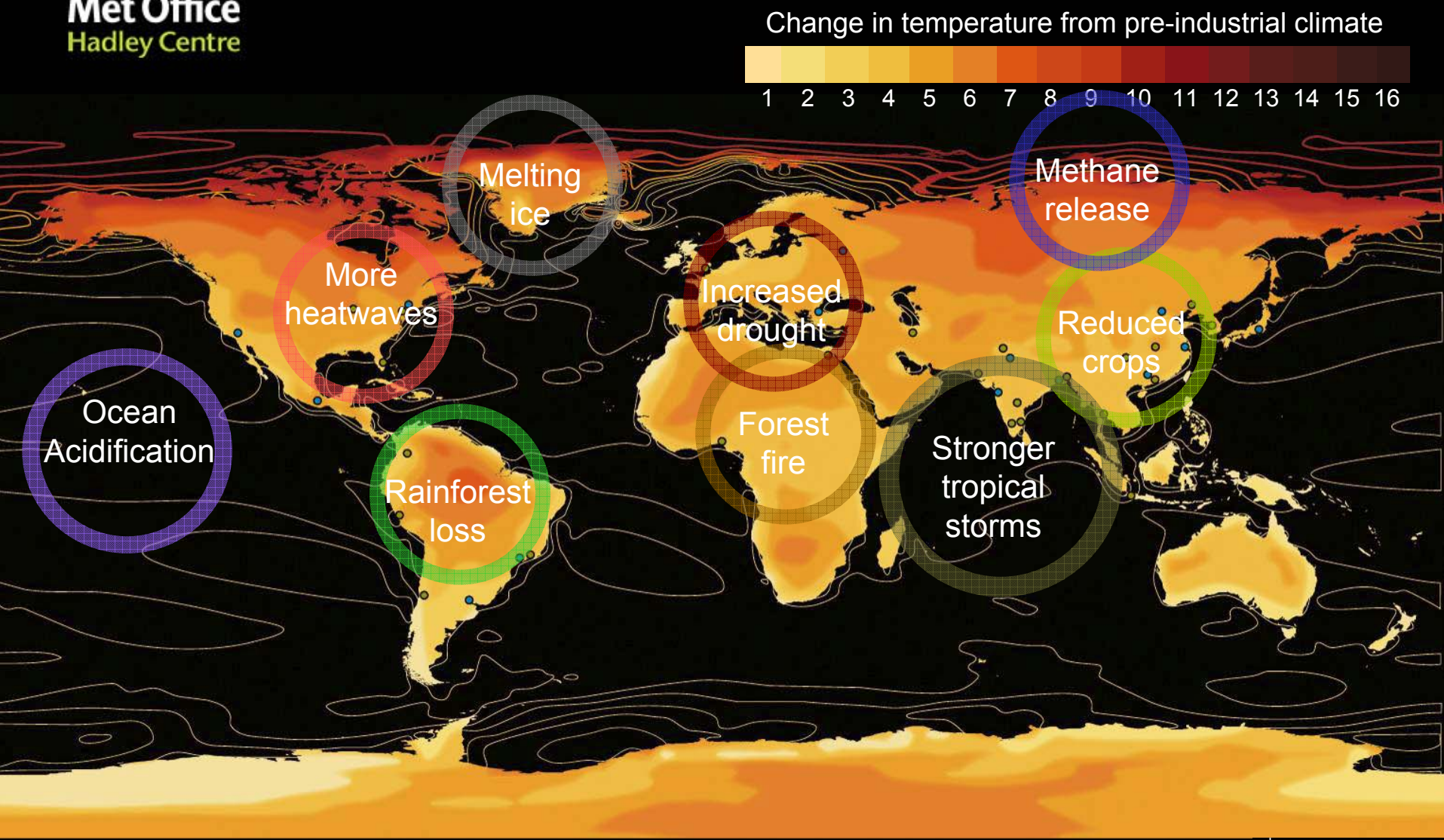

Current City population • 3-10 million • 10-20 million

HM Government

The impact of a global temperature rise of 2 ºC

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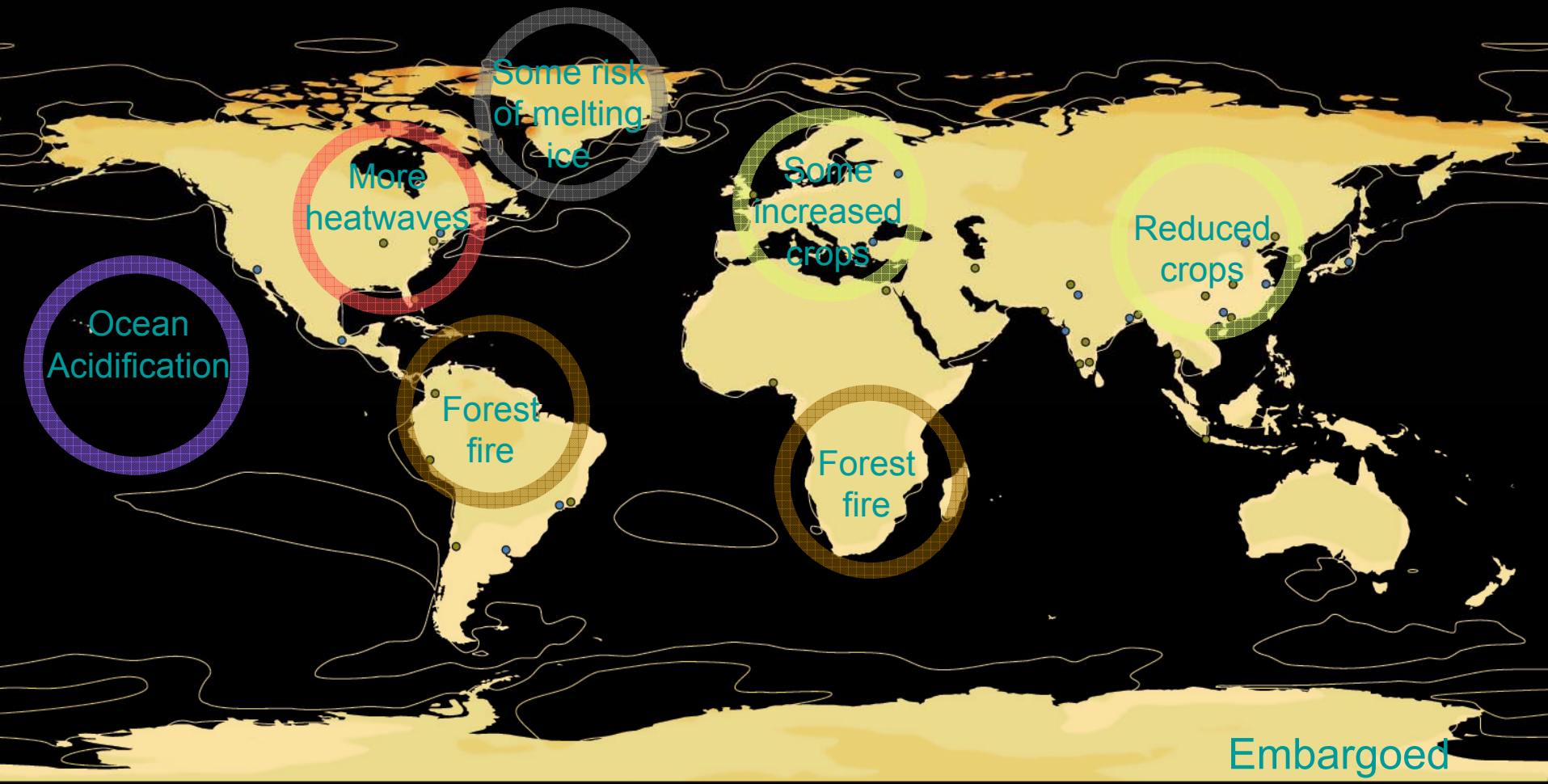
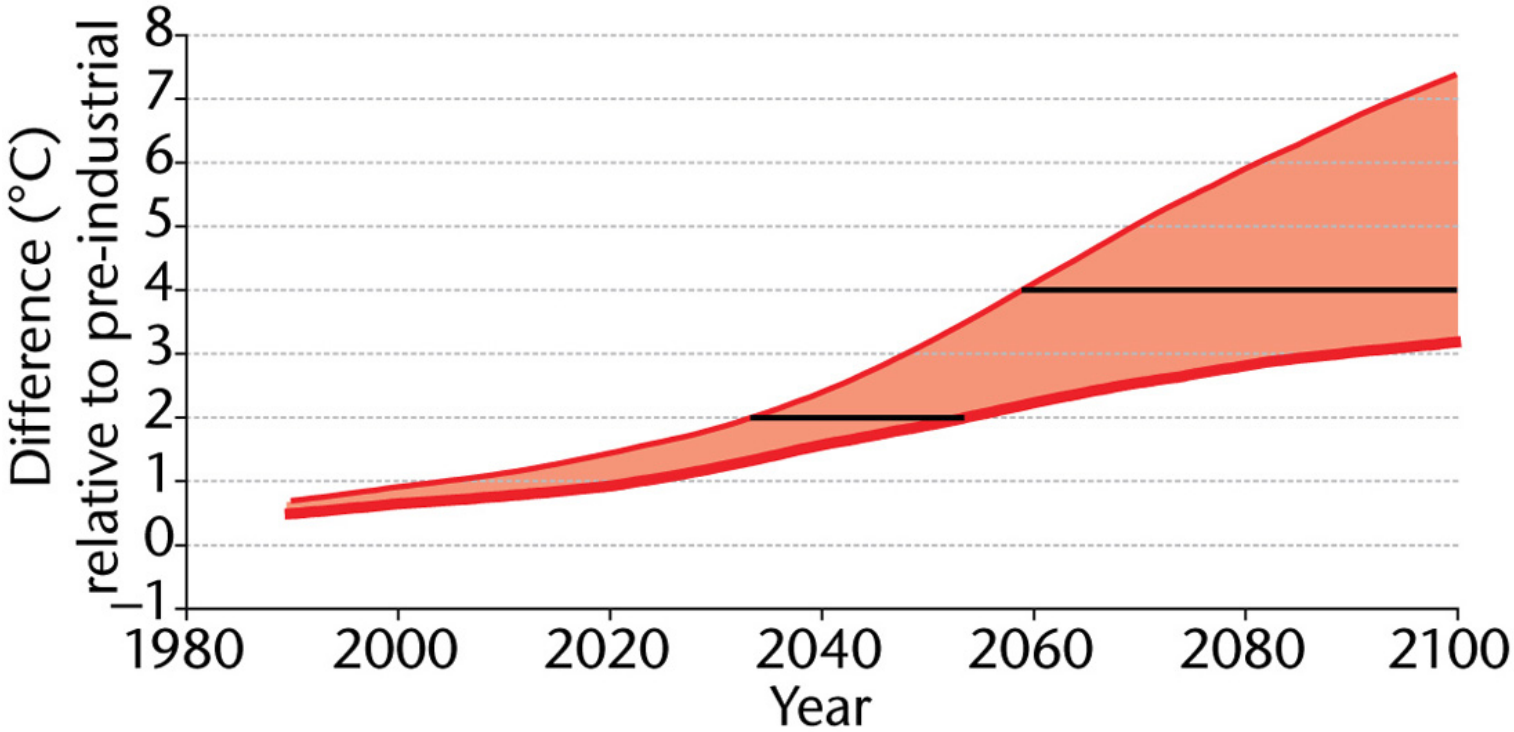
Change in temperature from pre-industrial climate

0 1 2 3 4 5 6 7 8 9



Embargoed

Current City population • 3-10 million • 10-20 million



- Business as usual emissions bring rapid warming:
- 2 ºC reached 2035-2055
- 4 ºC reached 2060- after 2100

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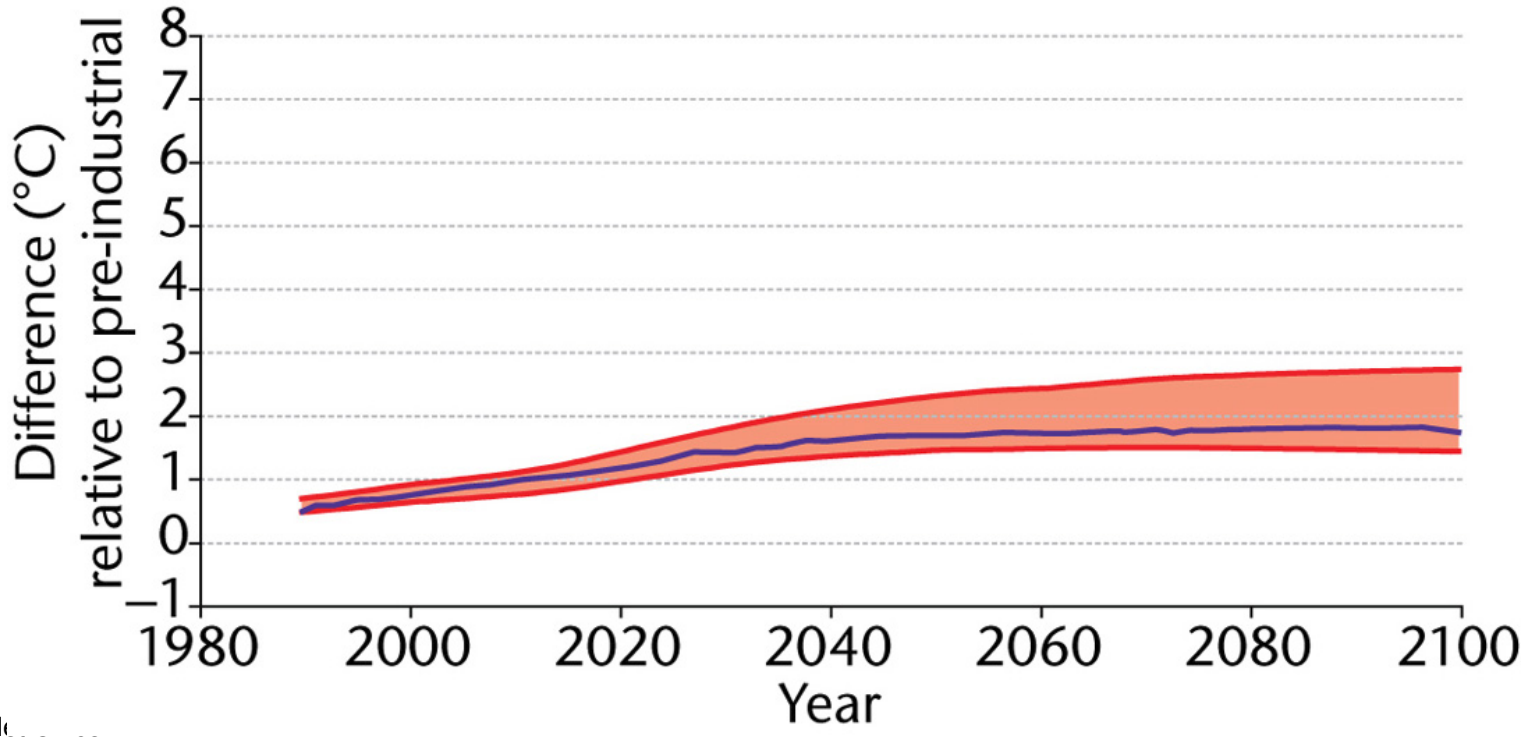
Mitigation scenarios help limit the impact of climate change, but still bring a 50% chance of going over 2

Each 10 year delay could add 0.2-0.5ºC to the temperature rise



Science: Driving our response to climate change

Informing mitigation

- Latest Observations
  - Global temperatures, decade prediction, El Nino, Sea ice
- Dangerous climate change
  New evidence of committed change
  - Greenland ice-sheet
  - Amazon rainforest
  - Methane release in the Arctic
  - Ocean acidification
- Impacts of 2 & 4 ºC
- Options for mitigation
  - Global analysis, mitigation scenarios,
  - Sector analysis
    - Aviation, Shipping, Black carbon

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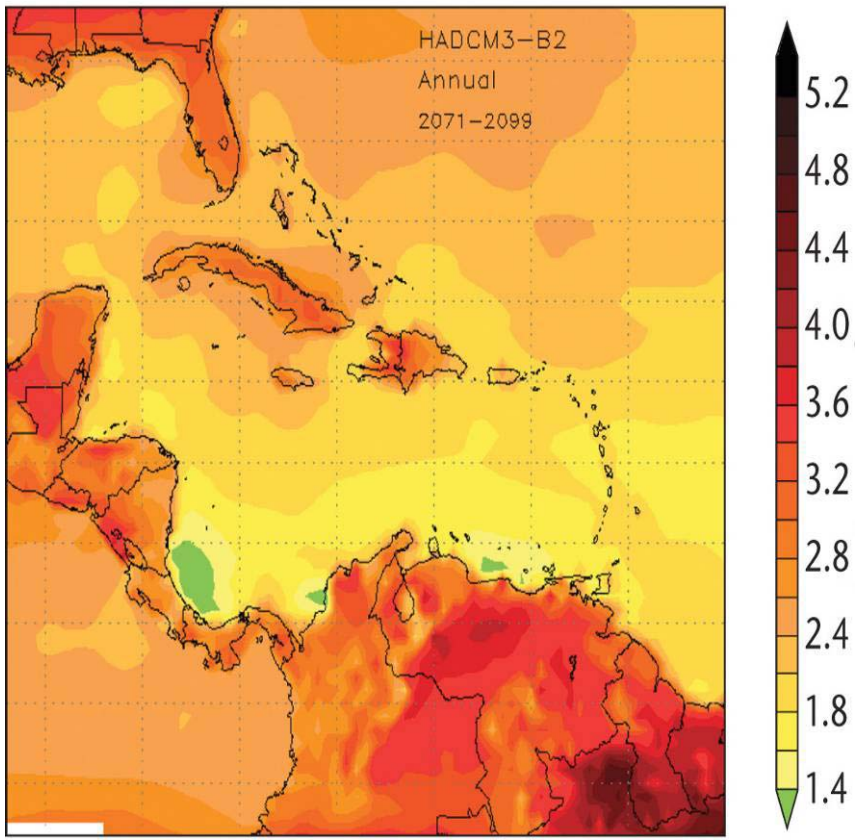
Informing choices
across the world

Working in partnership

PRECIS regional model tool provides for capacity building and decision making in developing countries

Temperature change 1961-90 to 2071-99



Crop	Temperature change (ºC)	% change in rainfall	Yield	Change in yield
Rice	0 +2 +2	0 +20 -20	3356 3014 2888	 -10% -14%
Beans	0 +2 +2	0 +20 -20	1354 1164 1093	 -14% -19%
Maize	0 +2 +2	0 +20 -20	4511 3737 3759	 -22% -17%

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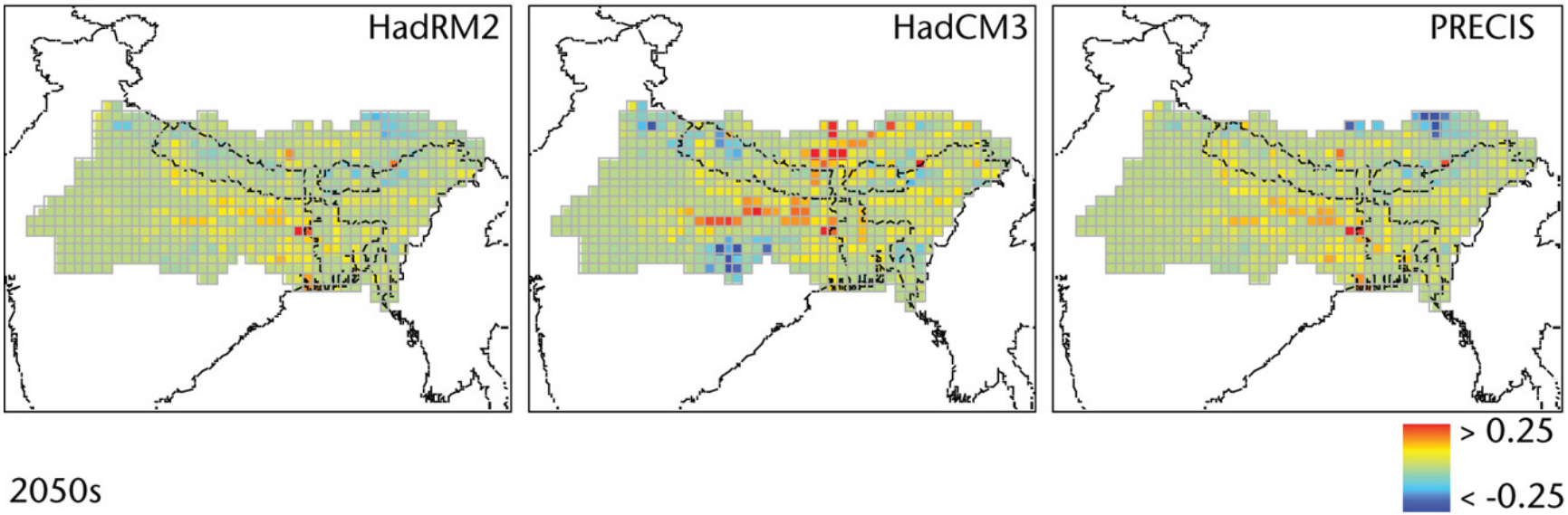
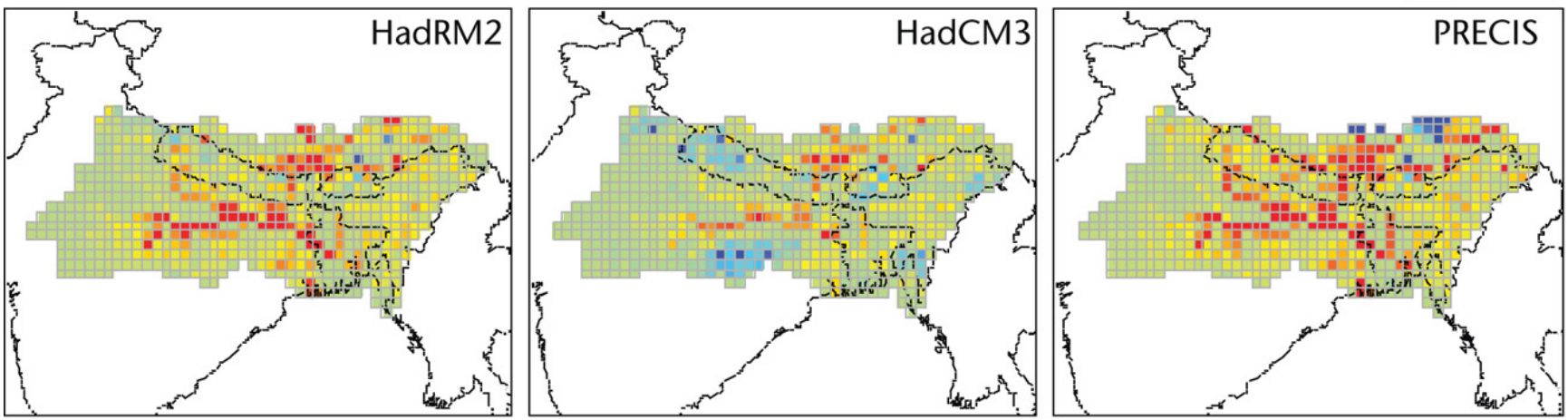
Changes in water availability around Bangladesh and surrounding area

Positive values mean increased water stress

2020s



2050s



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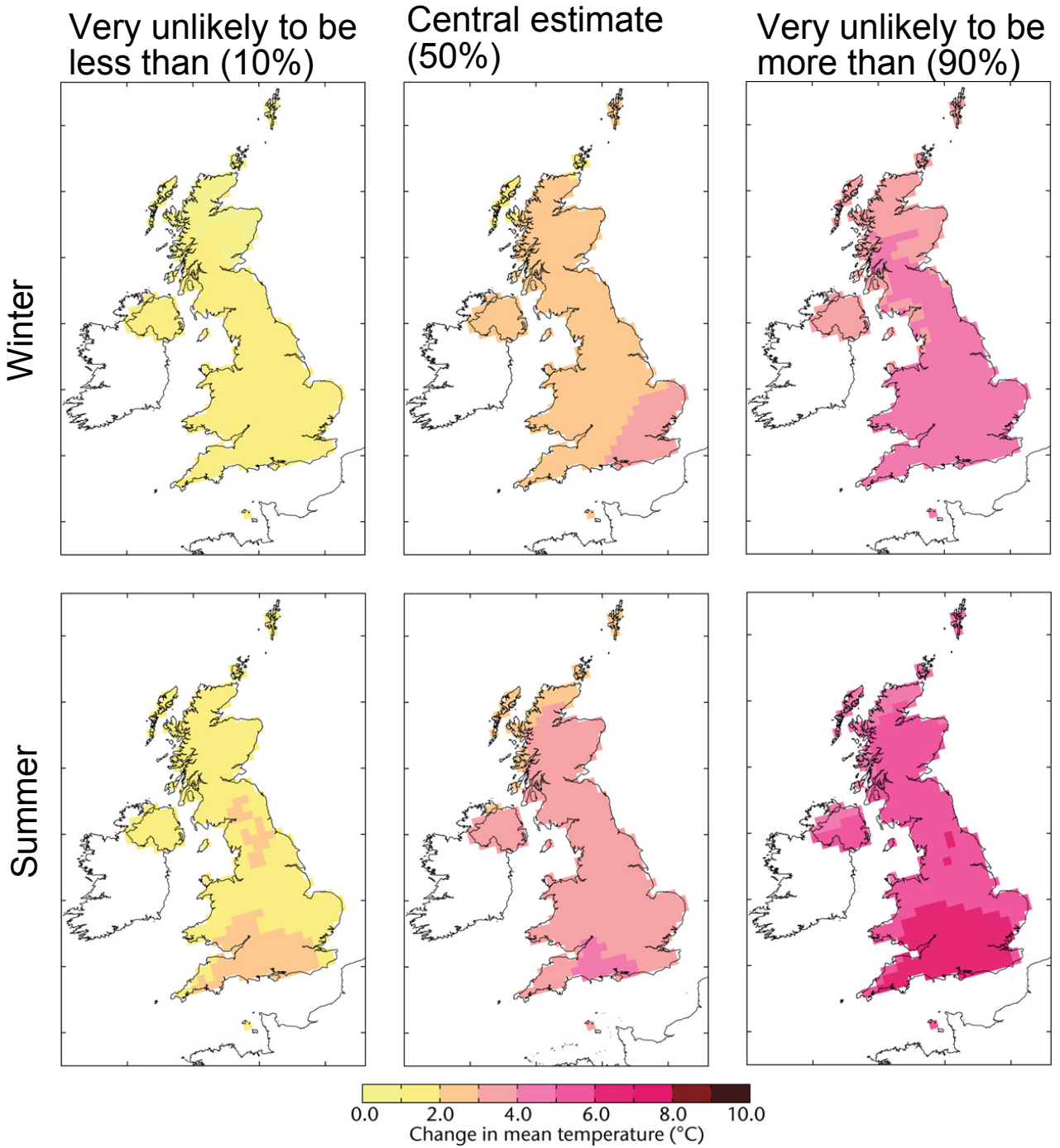
UK Climate Projections 2009

Changes in winter and summer temperature for a medium emissions scenario (A1B)

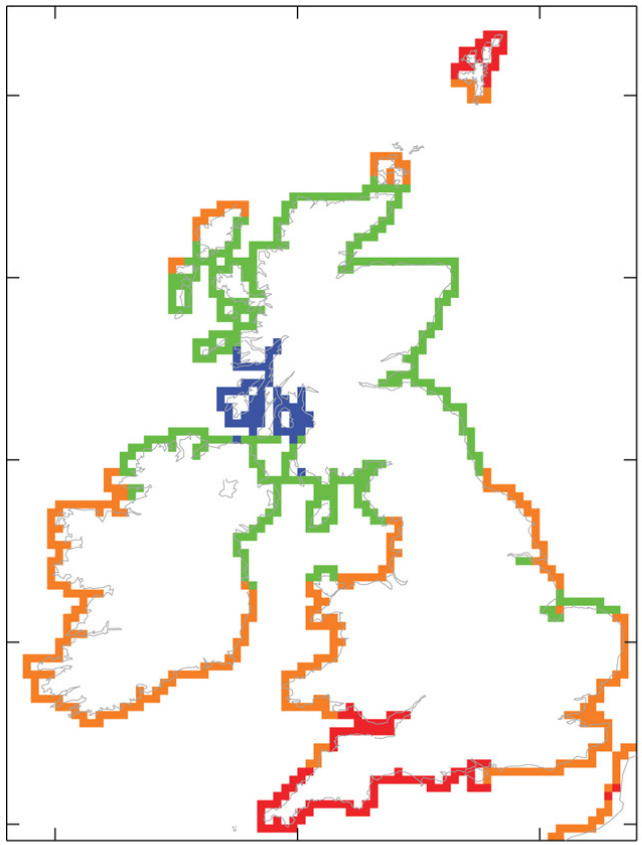


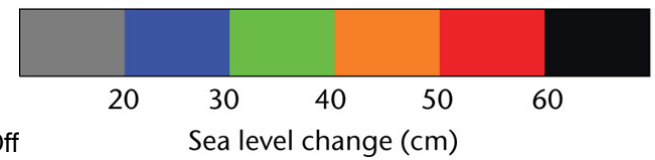
UK CLIMATE PROJECTIONS

Changes in coastal flood risk

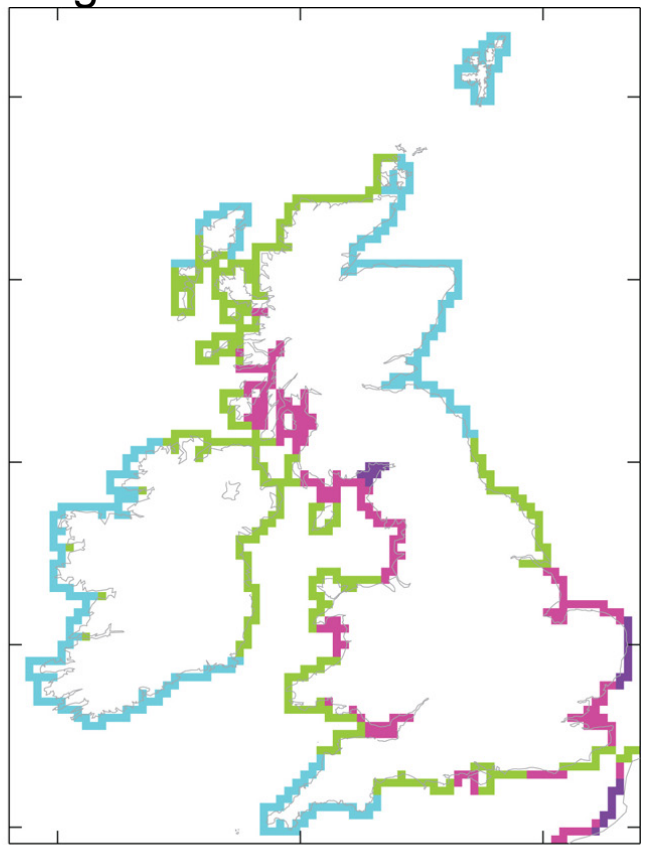
21st century change in the extreme sea level of the 50-year storm.

Central estimate from UKCP models





Upper limit of "high++“ model

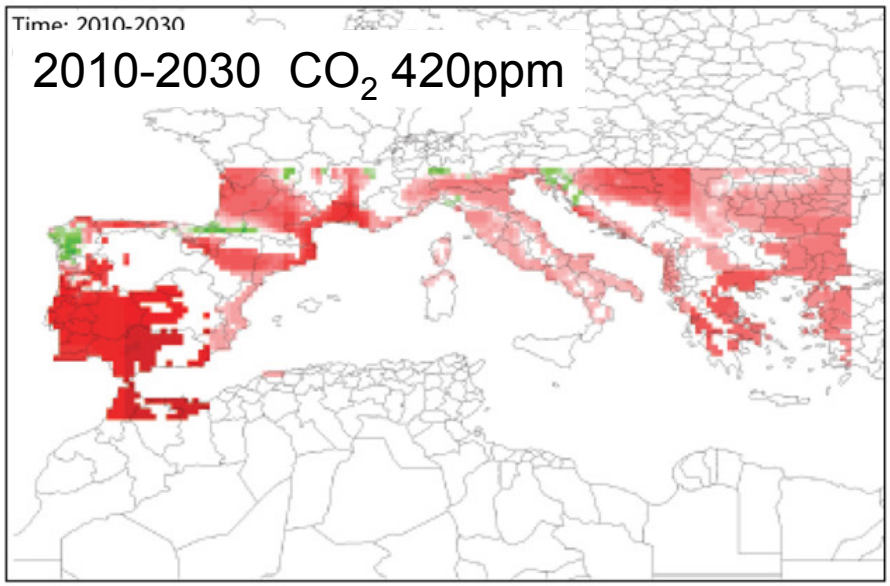


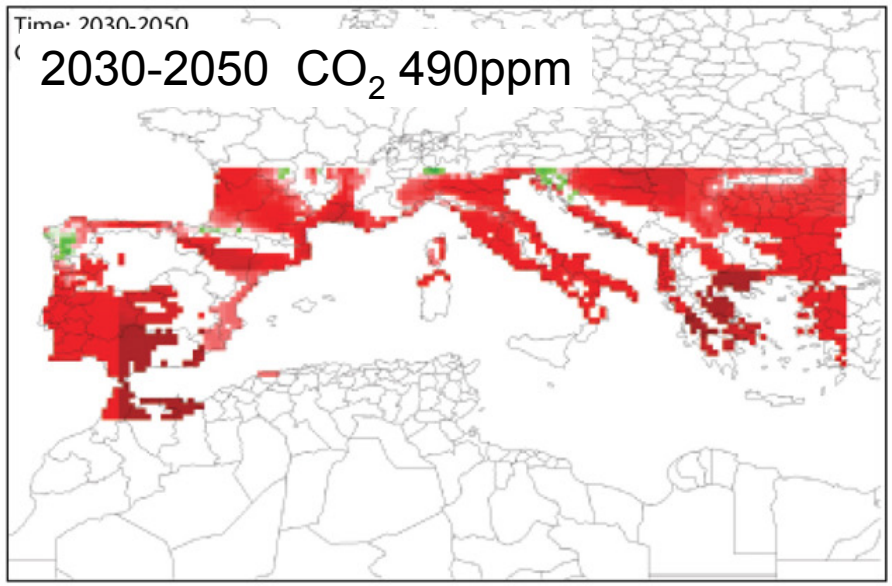
Durum wheat

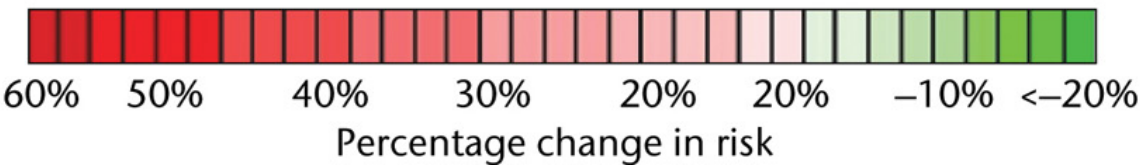
Red – increased risk of yield shortfall

Green – decreased risk

using ENSEMBLES models A1B scenario





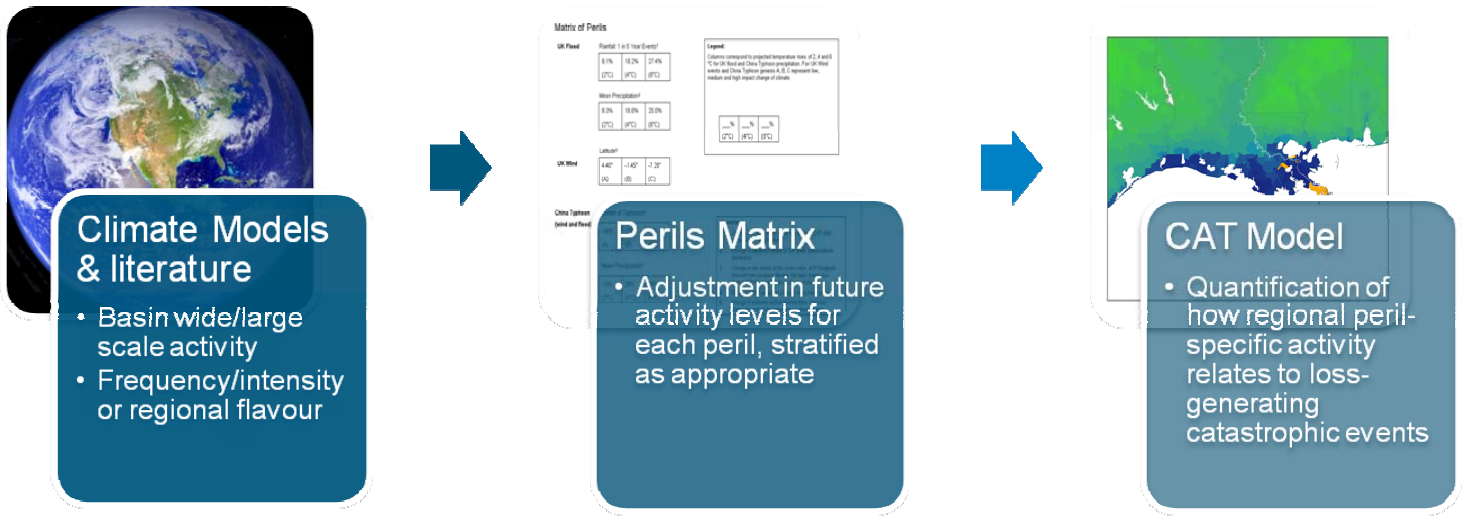


EU Ensembles

Met Office | ABI Association of British Insurers | AIR

A collaboration for the ABI research programme

The Financial Risks of Climate Change - Nov 2009



Objective scenarios of impacts on UK storms & rainfall, and Chinese typhoons, including post-IPCC AR4 science update:

- 1-in-200 year **typhoon** loss in **China** could reach £1.1 billion for a global temperature rise of 4°C (2008 exposure levels and £)
- Average annual insured **wind** losses for the **UK** could rise by 25% to £827 million for slight southward shift in storm track; which could arise from current **natural climate** variations.
- **Insured flood losses** occurring on average once every 100 years in the UK could rise by 30% to £5.4 billion for a global temperature rise of 4°C