

Climate change: the facts



Professor Mark Maslin (University College London)

With thanks to Prof. Ed Hawkins (Reading University), Dr Tamsin Edwards (Kings College London) and Prof. Andrea Sella (UCL)

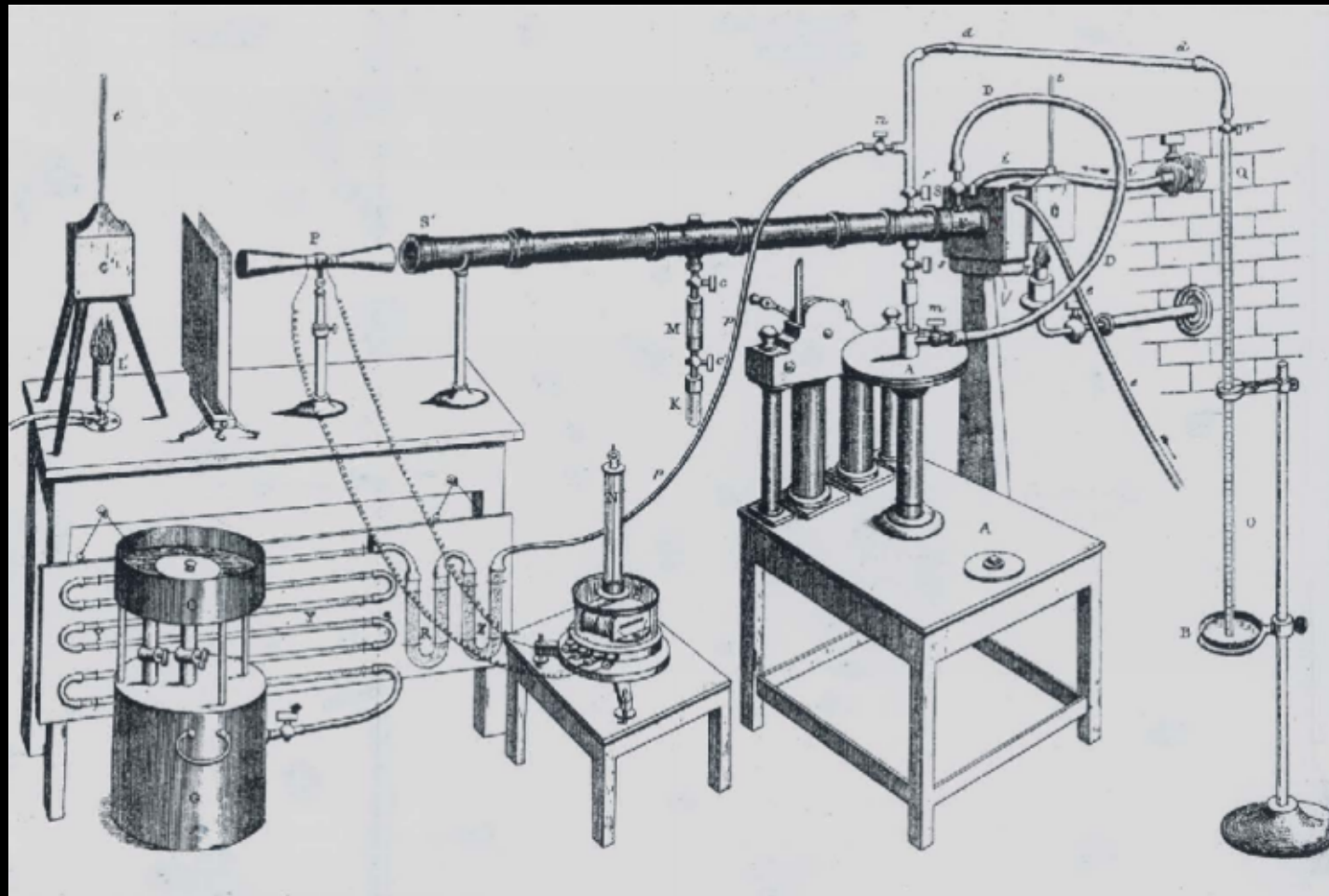
Tyndall explained the physics of the greenhouse effect in 1850s



Eunice Foote
(1819-1888)



John Tyndall
(1820-1893)



The Greenhouse Effect

Solar radiation powers the climate system.



Some solar radiation is reflected by the Earth and the atmosphere.



ATMOSPHERE

EARTH

About half the solar radiation is absorbed by the Earth's surface and warms it.

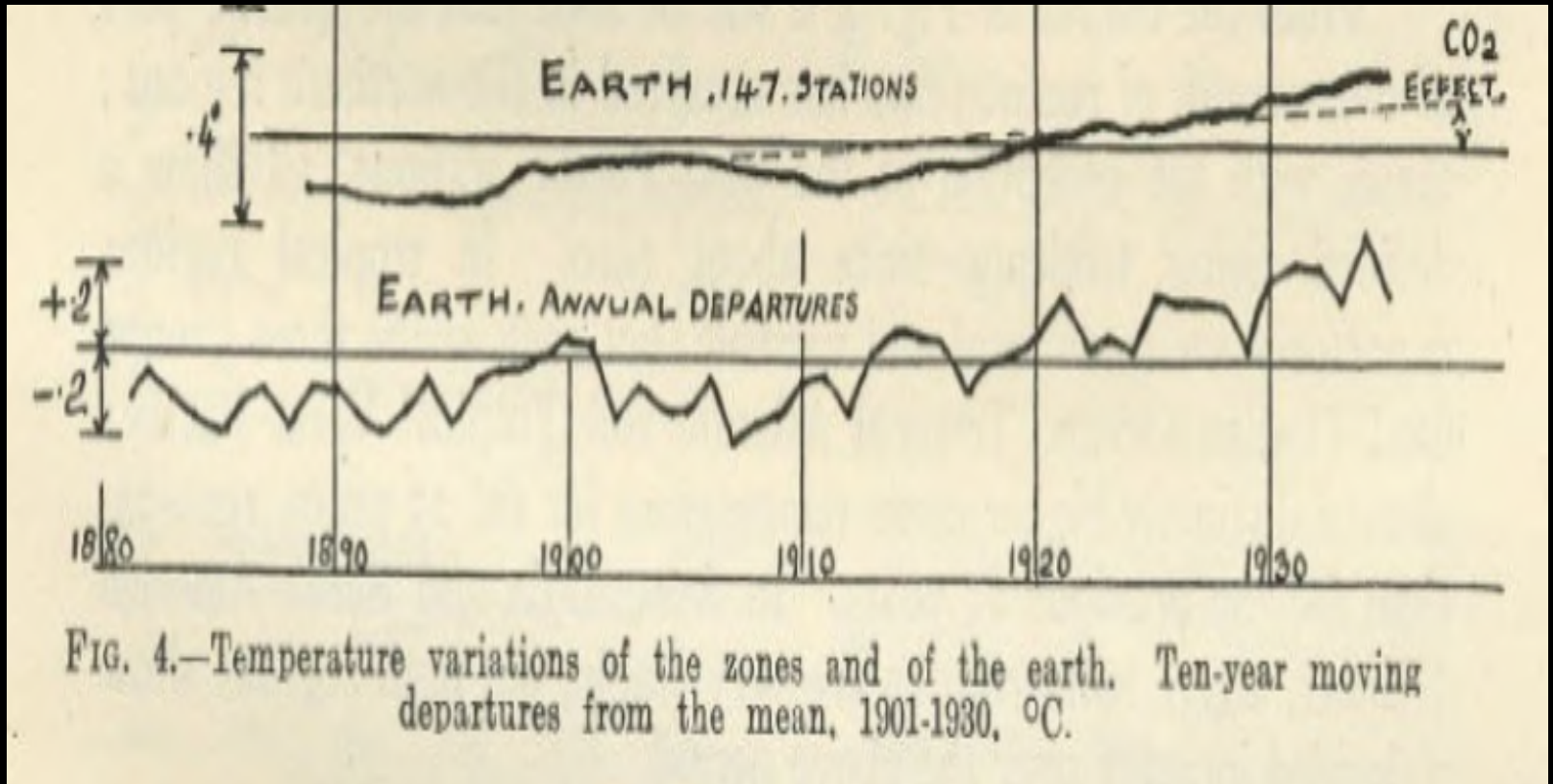
Infrared radiation is emitted from the Earth's surface.



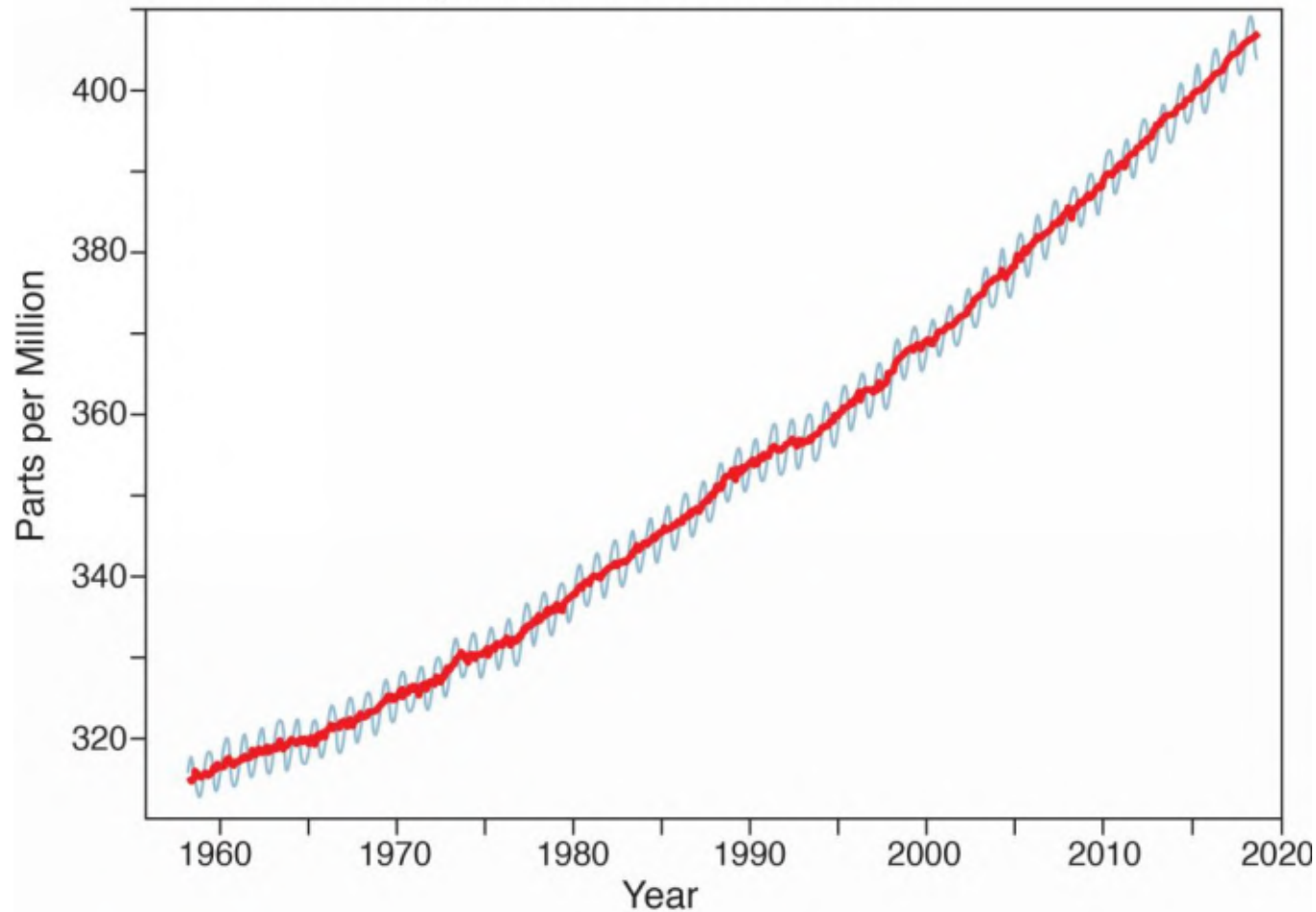
Guy Callendar was first to discover the world was warming in 1938



Guy Callendar
(1898-1964)



Atmospheric CO₂ at Mauna Loa Observatory



Carbon dioxide levels in the atmosphere have increased by 45% since the industrial revolution

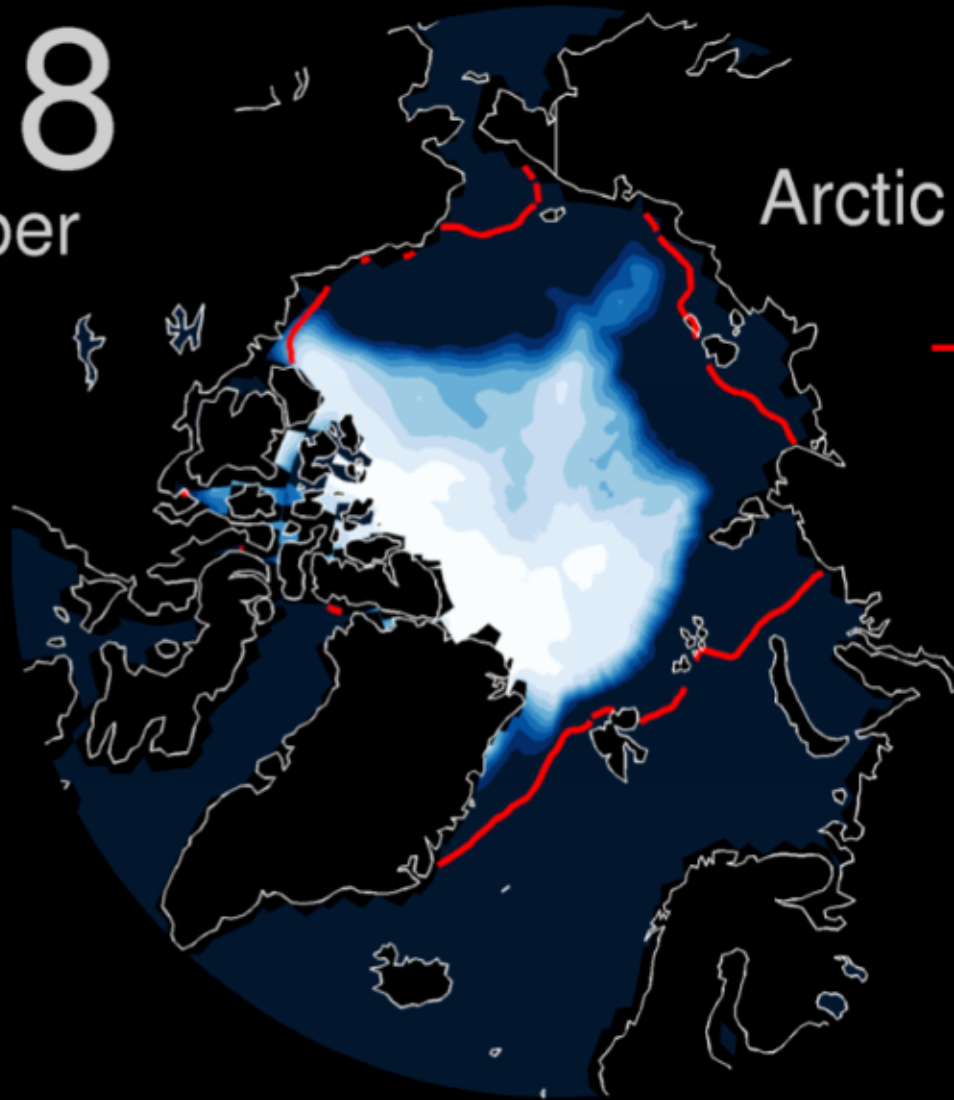
Highest in 3 million years

2018

September

Arctic sea ice

— Edge in 1980s



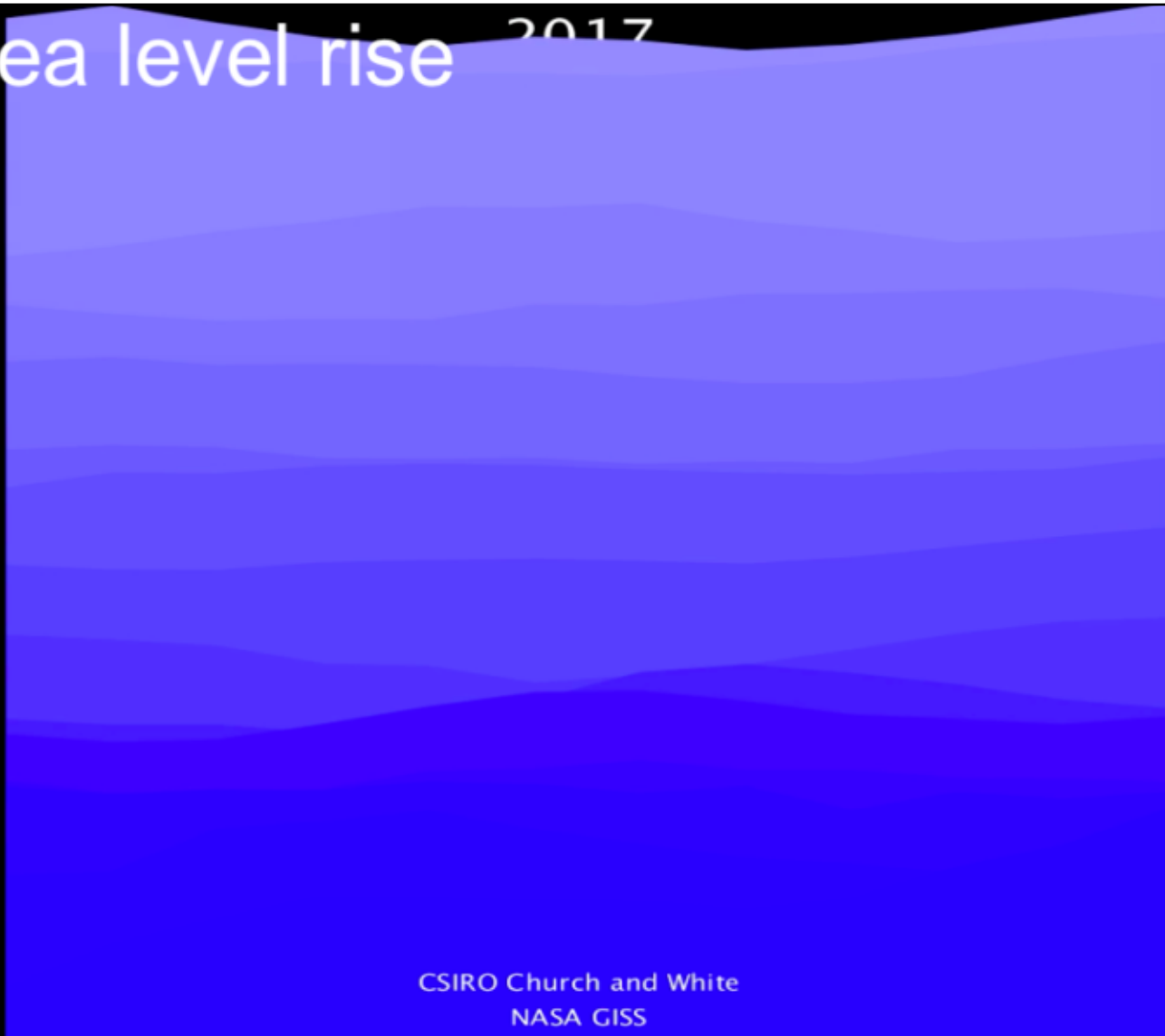
Global sea level rise 2017

22 cm
20 cm
18 cm
16 cm
14 cm
12 cm
10 cm
8 cm
6 cm
4 cm
2 cm
0 cm

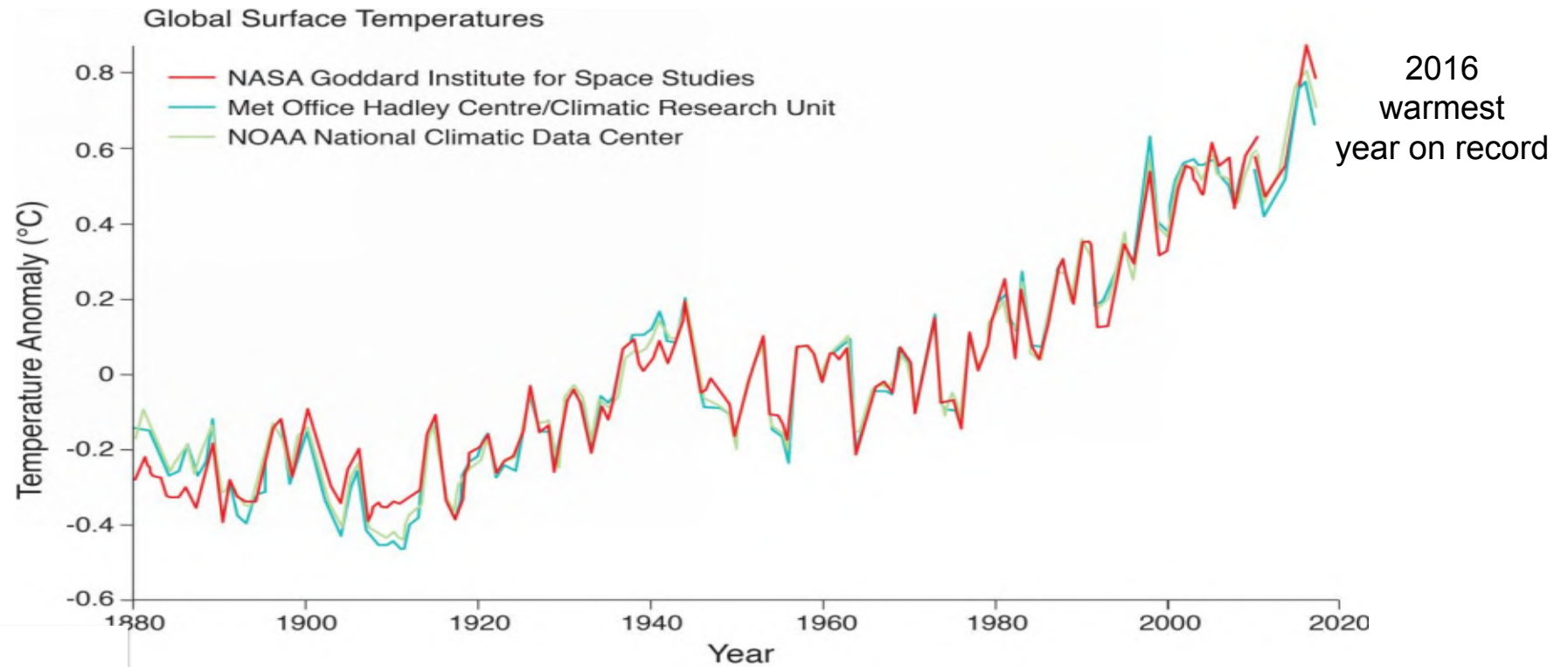
2010
2000
1990
1980
1970
1960
1950
1940
1930
1920
1910
1890
1880

CSIRO Church and White
NASA GISS

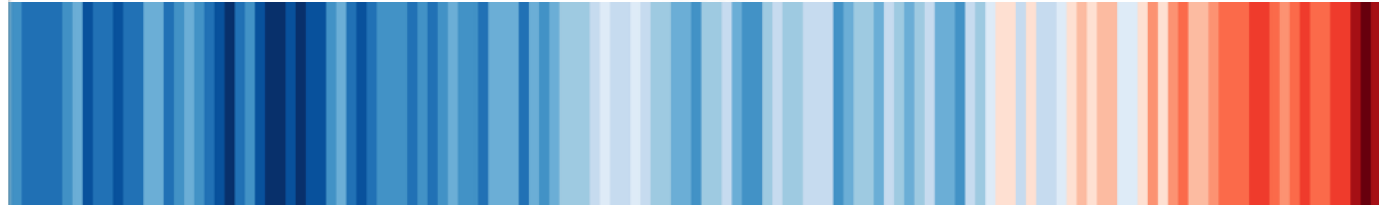
Graphic:
Kevin Pluck



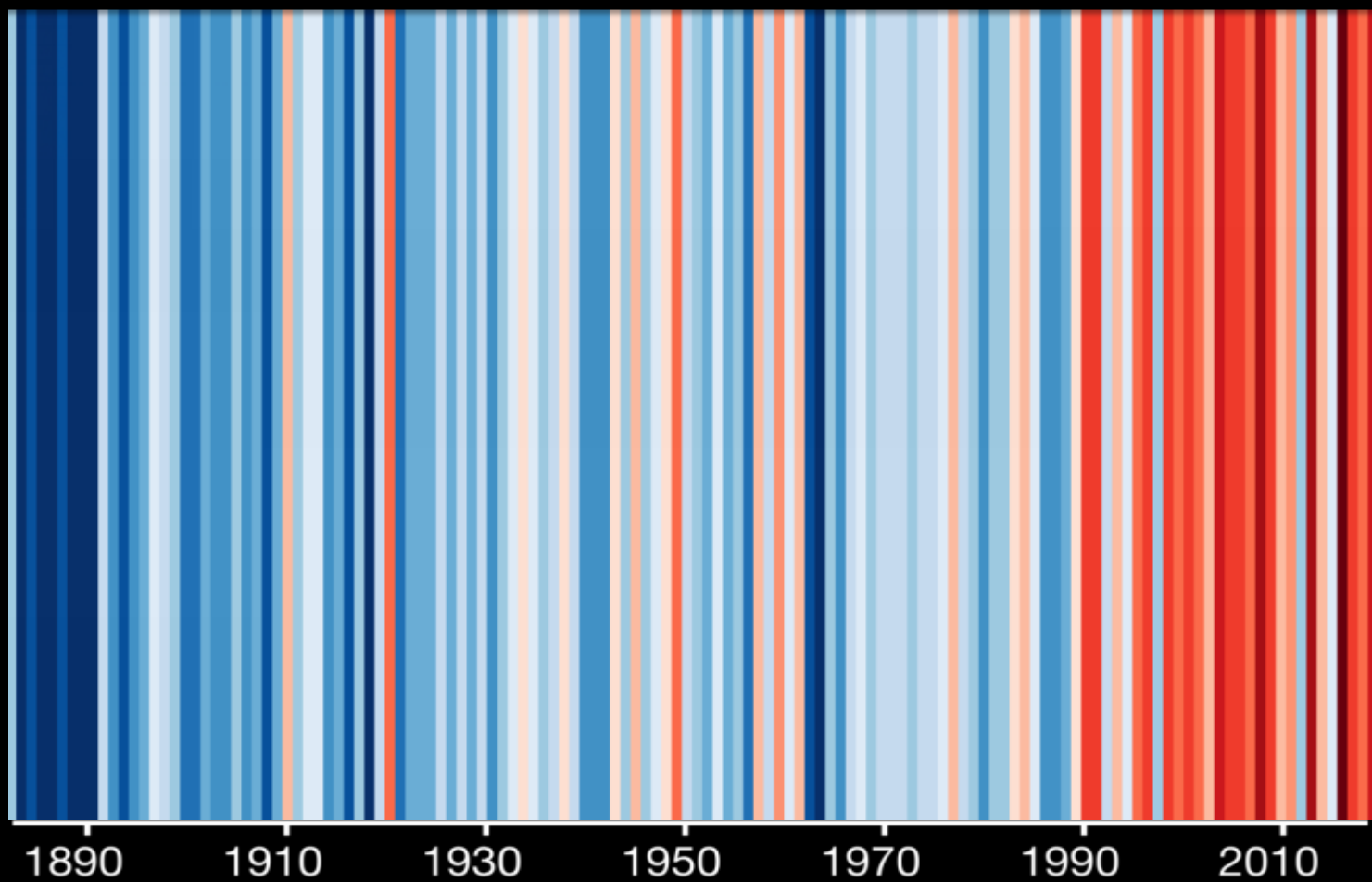
Annual global temperatures (1880-2018)



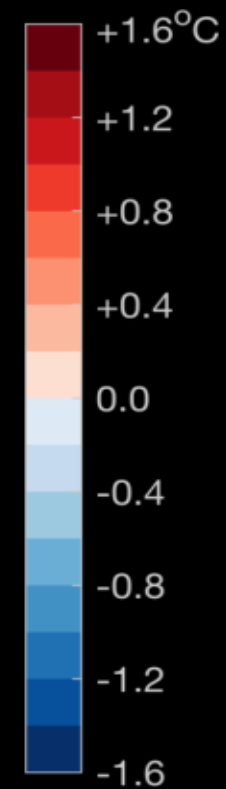
#warmingstripes
Date Met Office
From Ed Hawkins



London temperatures (1850-2018)



Difference from
20th century
average

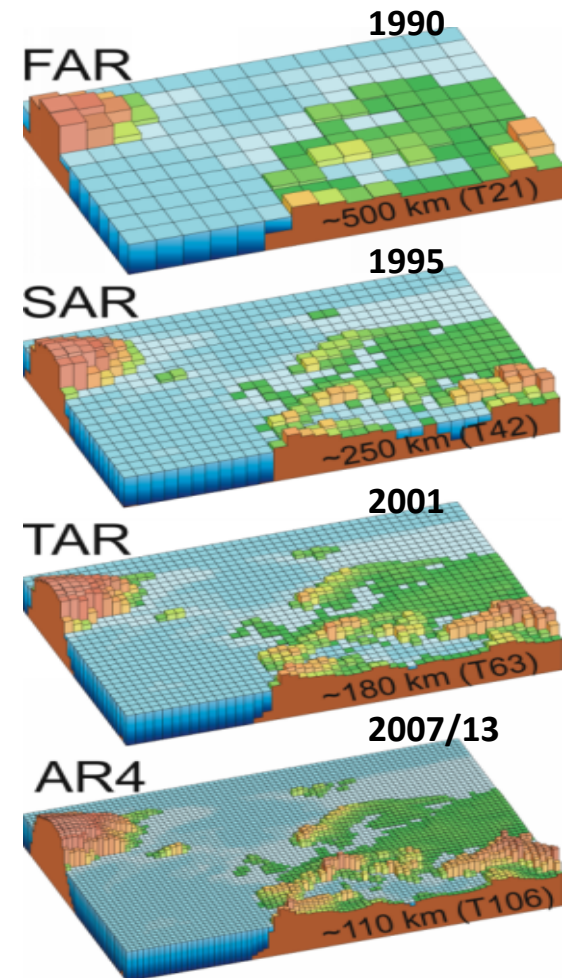
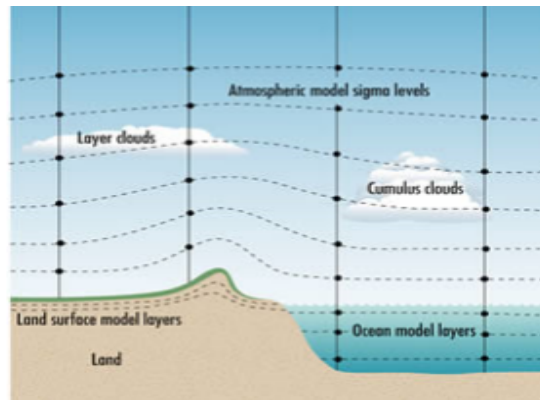


Data: Met Office

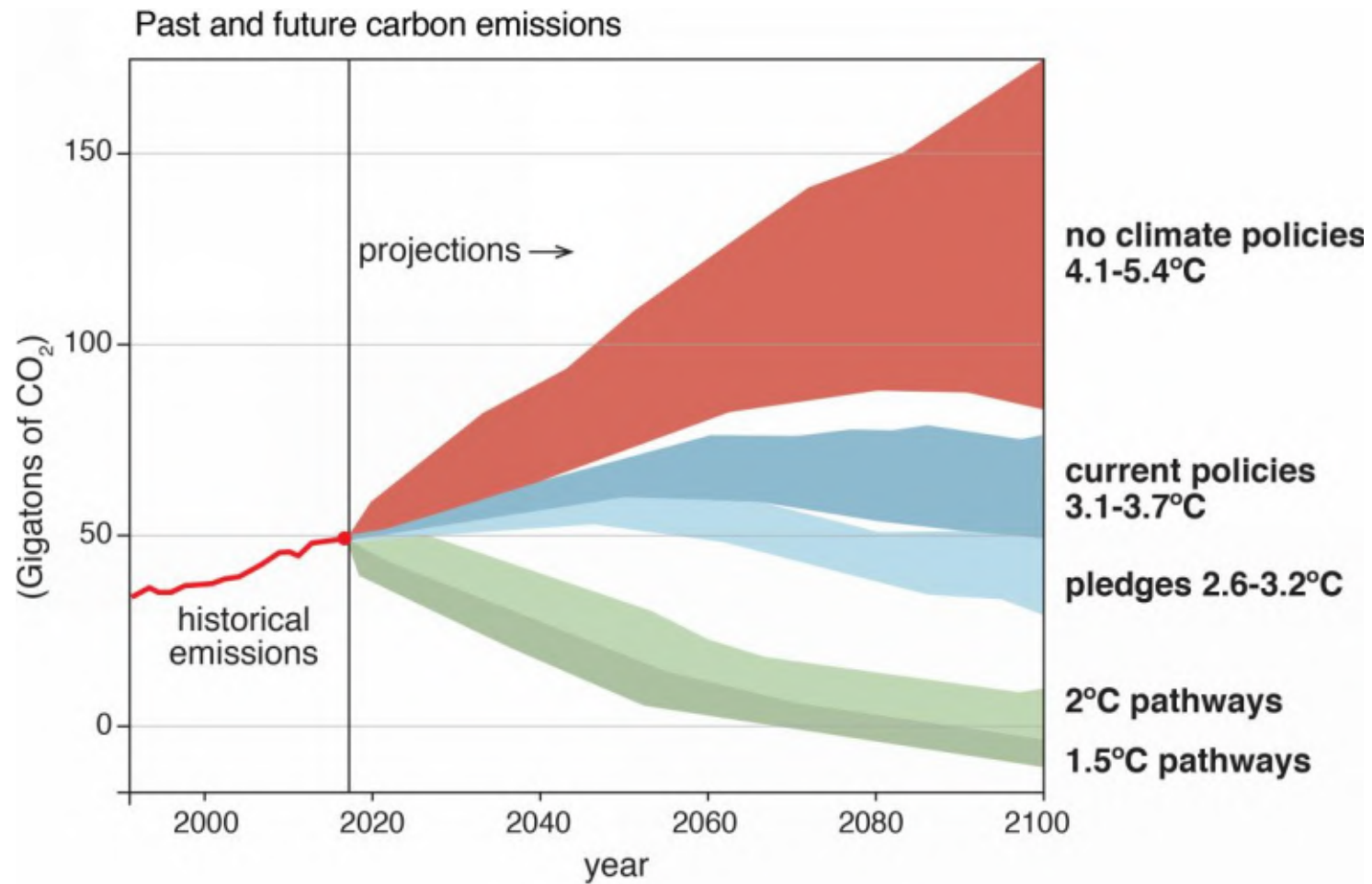
What about
the future....

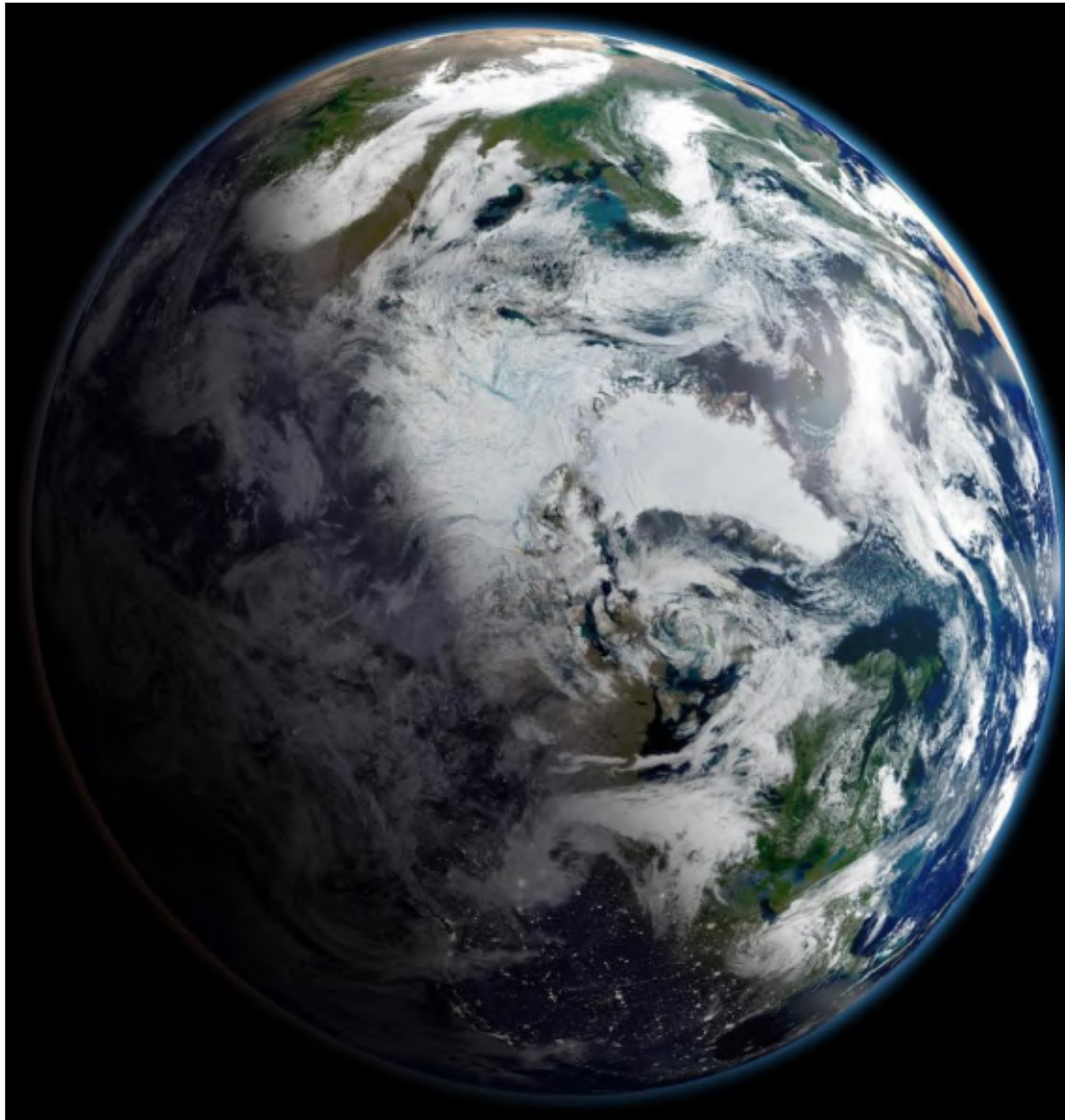


Supercomputer models provide visions of the future



Future warming depends on our choice of carbon emissions





The UN Paris Agreement aims to avoid the worst risks by cutting global CO₂ emissions to 'net zero' during the 21st century.

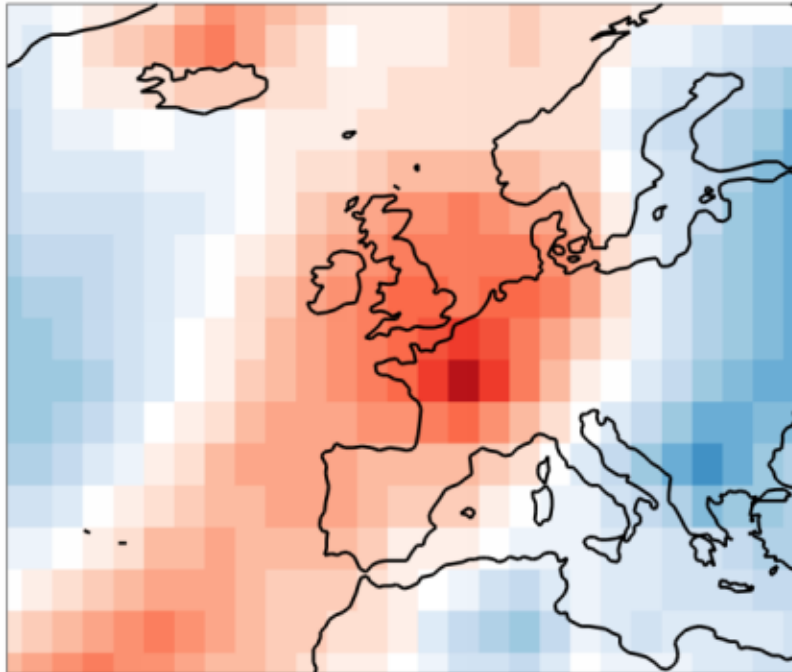
Achieving this will require a complete transformation of energy generation, industry, infrastructure, and personal behaviours.

Climate change: local impacts and solutions

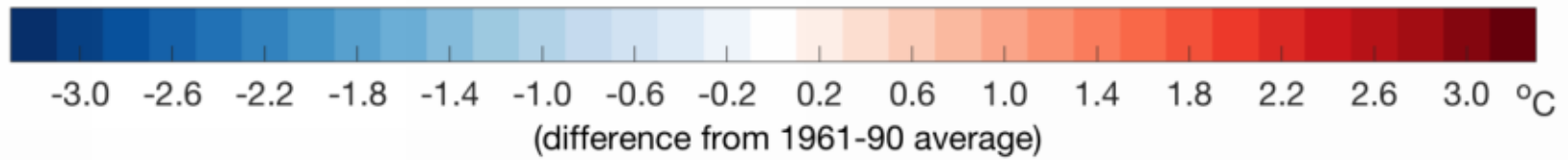
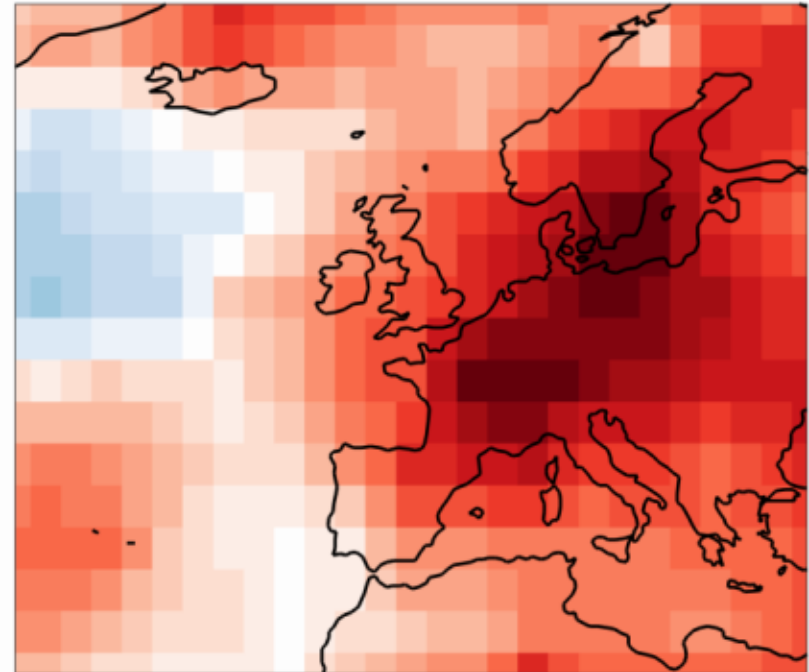


Warmer than normal?

Summer 1976

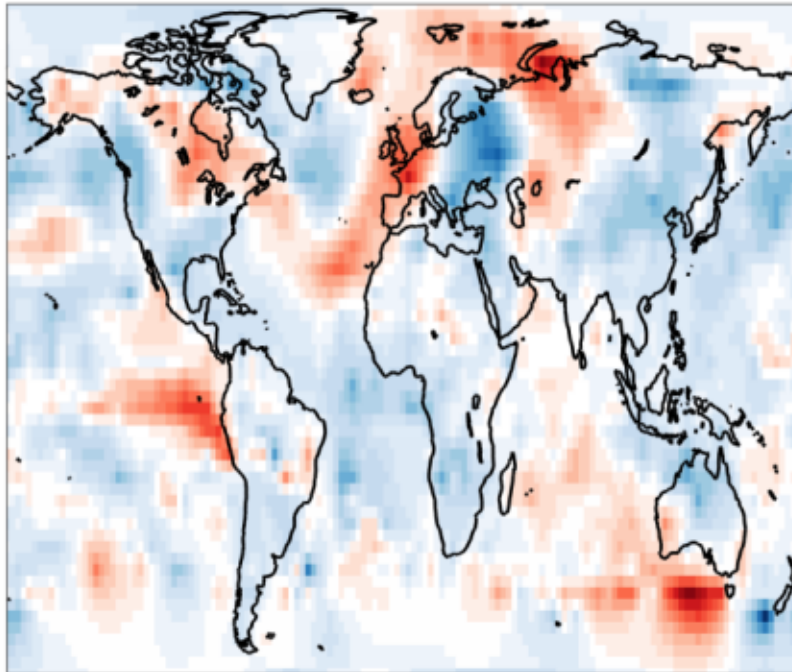


Summer 2018

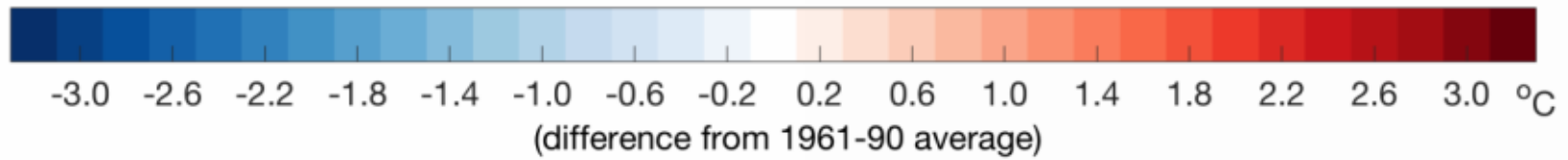
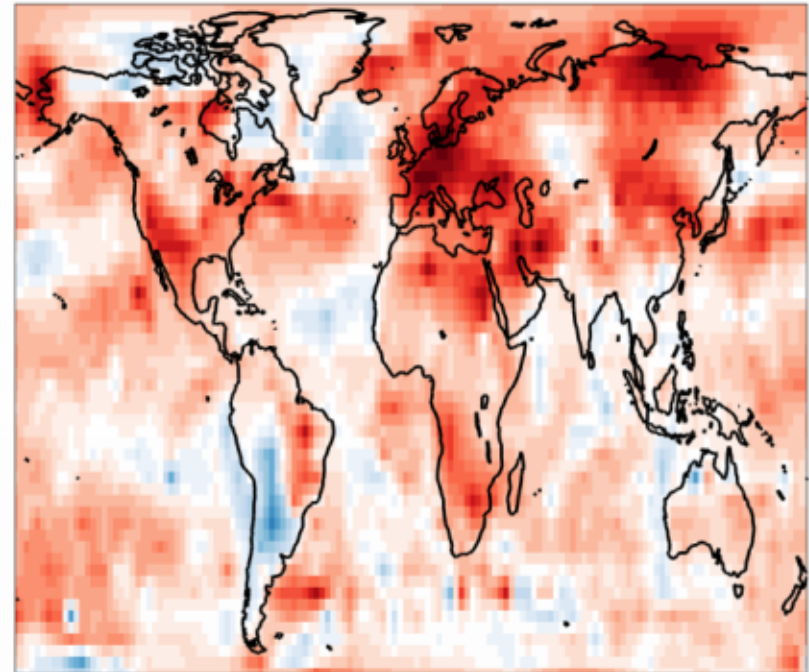


Warmer than normal?

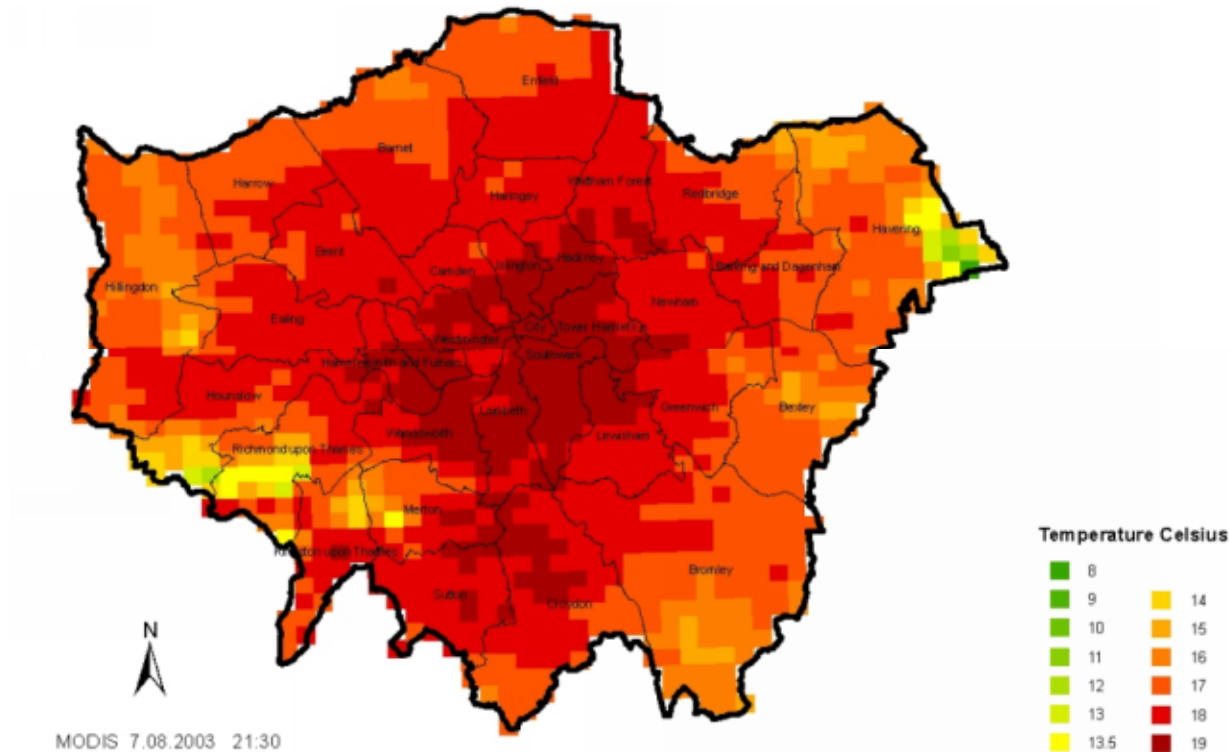
Summer 1976



Summer 2018

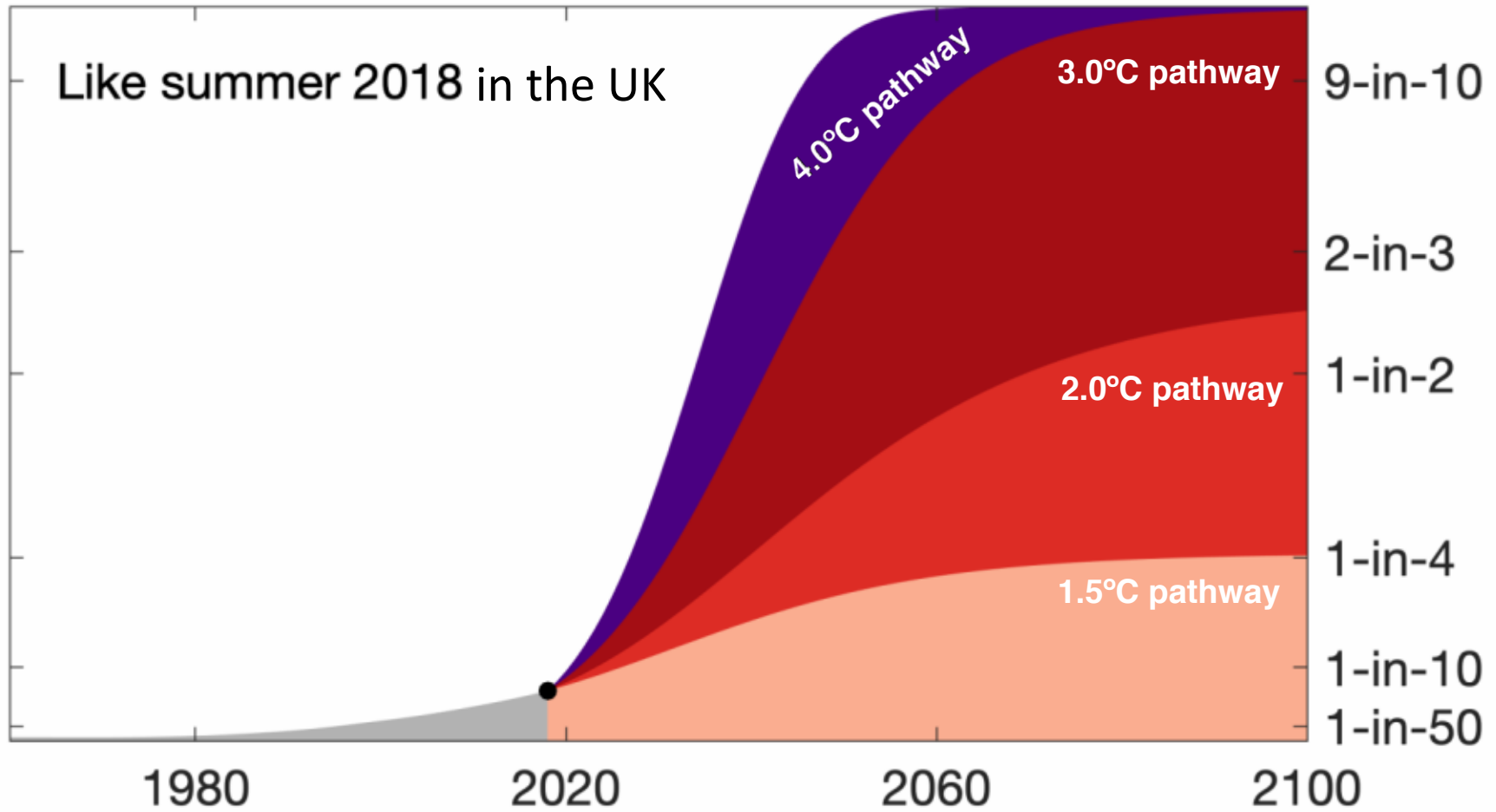


2003 heat wave Central London >9°C hotter



70,000 elderly people died in North Europe

RISK OF EXTREME SEASON



Summers like those of 1976, 2003,
2007 and 2018 will be normal



Dungeness 2018

Extreme rainfall events
will be more frequent



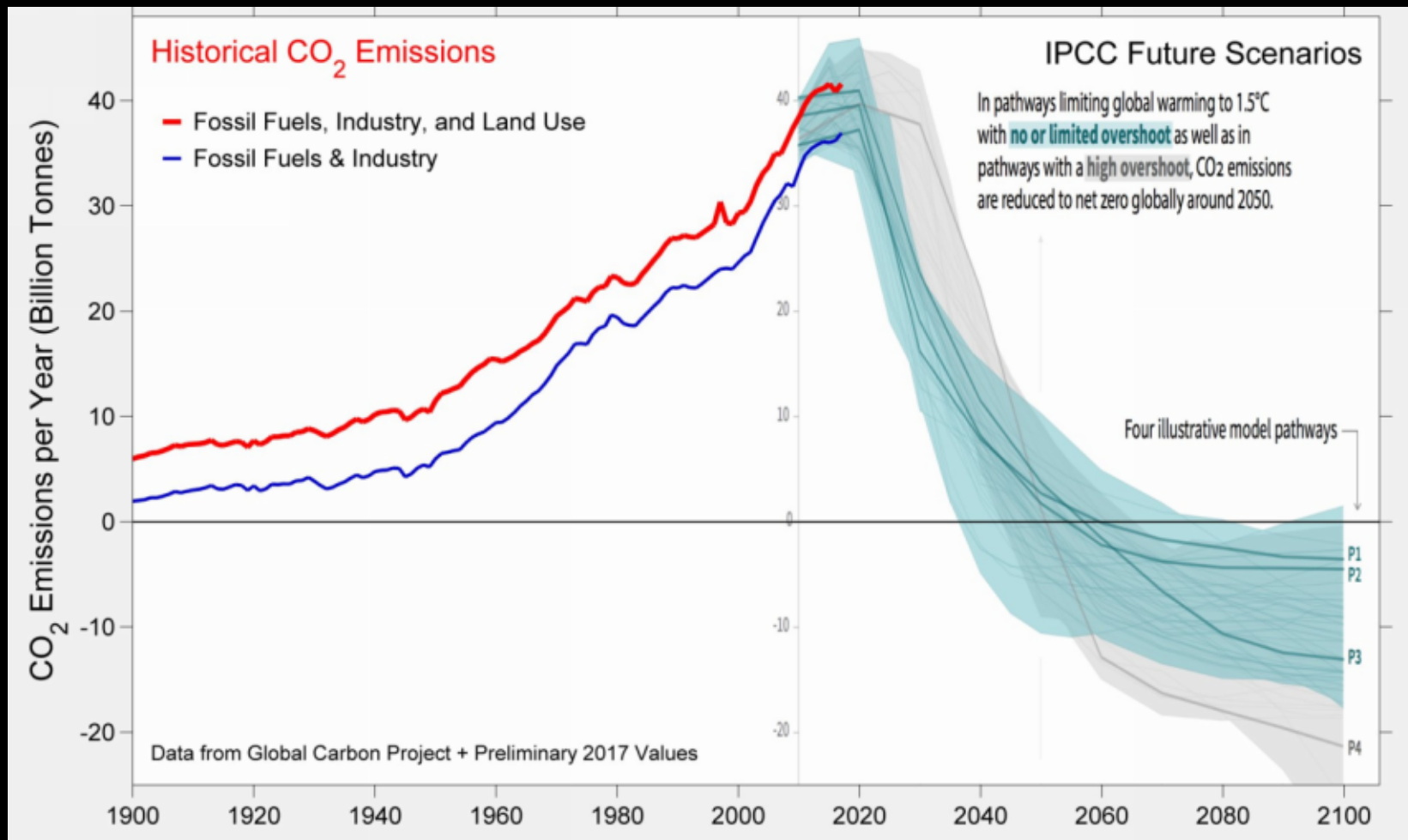
We will still get sharp cold snaps
like the “Beast from the East”





We will probably need to adapt or rebuild the Thames Barrier and Dawlish railway line due to sea level rise and storm surges

Possible pathways to 1.5°C – ‘technically feasible’



transport international agreements

geoengineering afforestation land use

tradeoffs energy generation
flying

win-win solutions

heating CO₂ removal economy

diet biodiversity

waste population poverty

protests

Possible government actions to achieve 'net zero' carbon emissions

- Support renewable energy
- Cut fossil fuel subsidies
- Reforest and Rewild the UK
- Promote low emission farming and diet
- Tax fossil fuel use (including aviation fuel)
- Support 'electric' cars and public transport
- Enforce building regulations & support retrofitting
- Support the EU Emissions Trading Scheme



Possible individual climate change actions

- Talk about it, to everyone
- Switch to a more vegetarian or vegan diet
- Switch to renewable energy supplier
- Reduce, reuse and recycle more
- Use cars less or get an electric/hybrid car
- Stop flying – if you must, then offset
- Divest your pensions from fossil fuels
- Protest and vote



July 2007



Cheltenham Playhouse in Bath Road

City level mitigation and adaptation is essential

The battle against climate change will be won or lost in our cities – London can lead the way!

