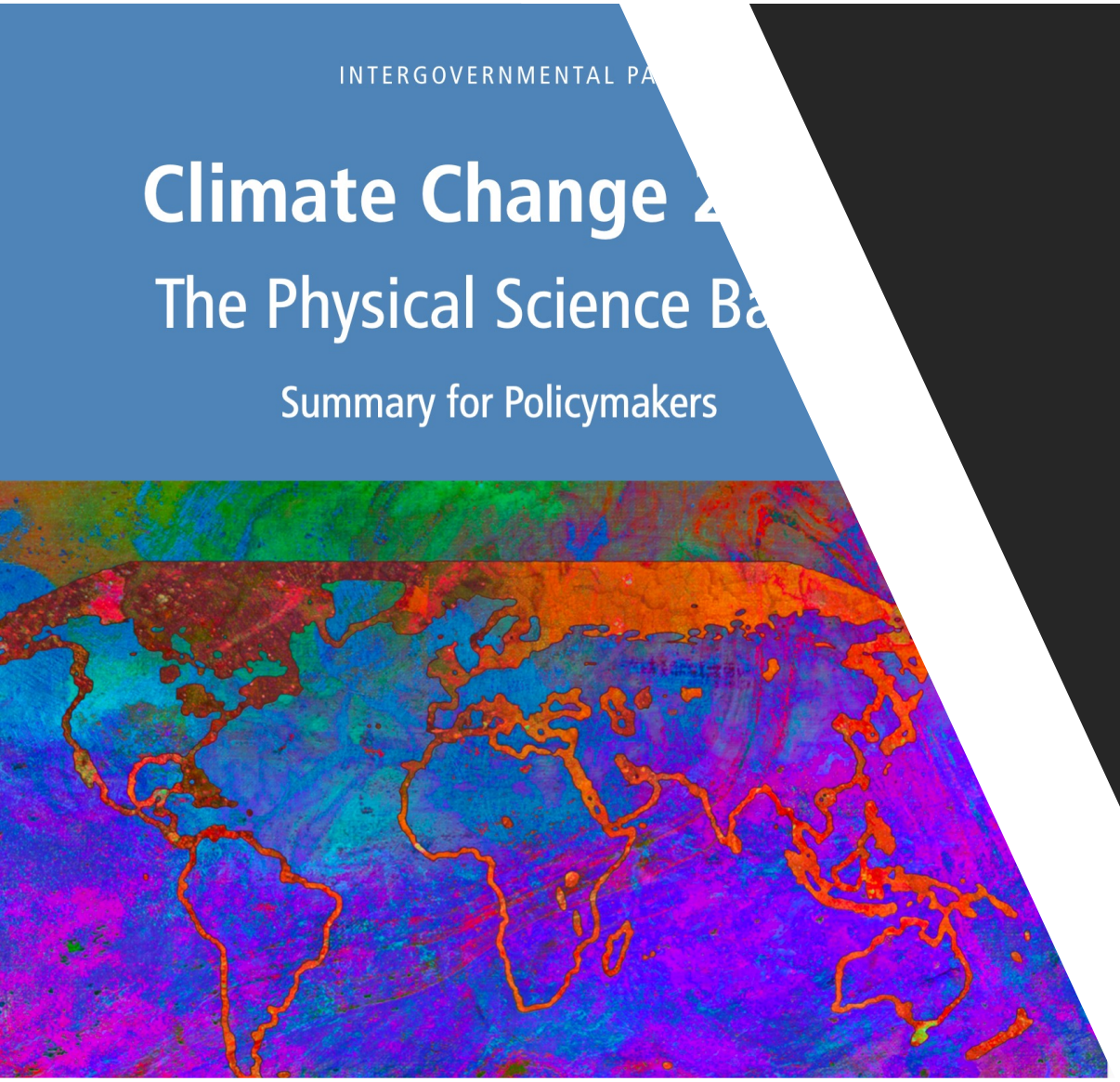


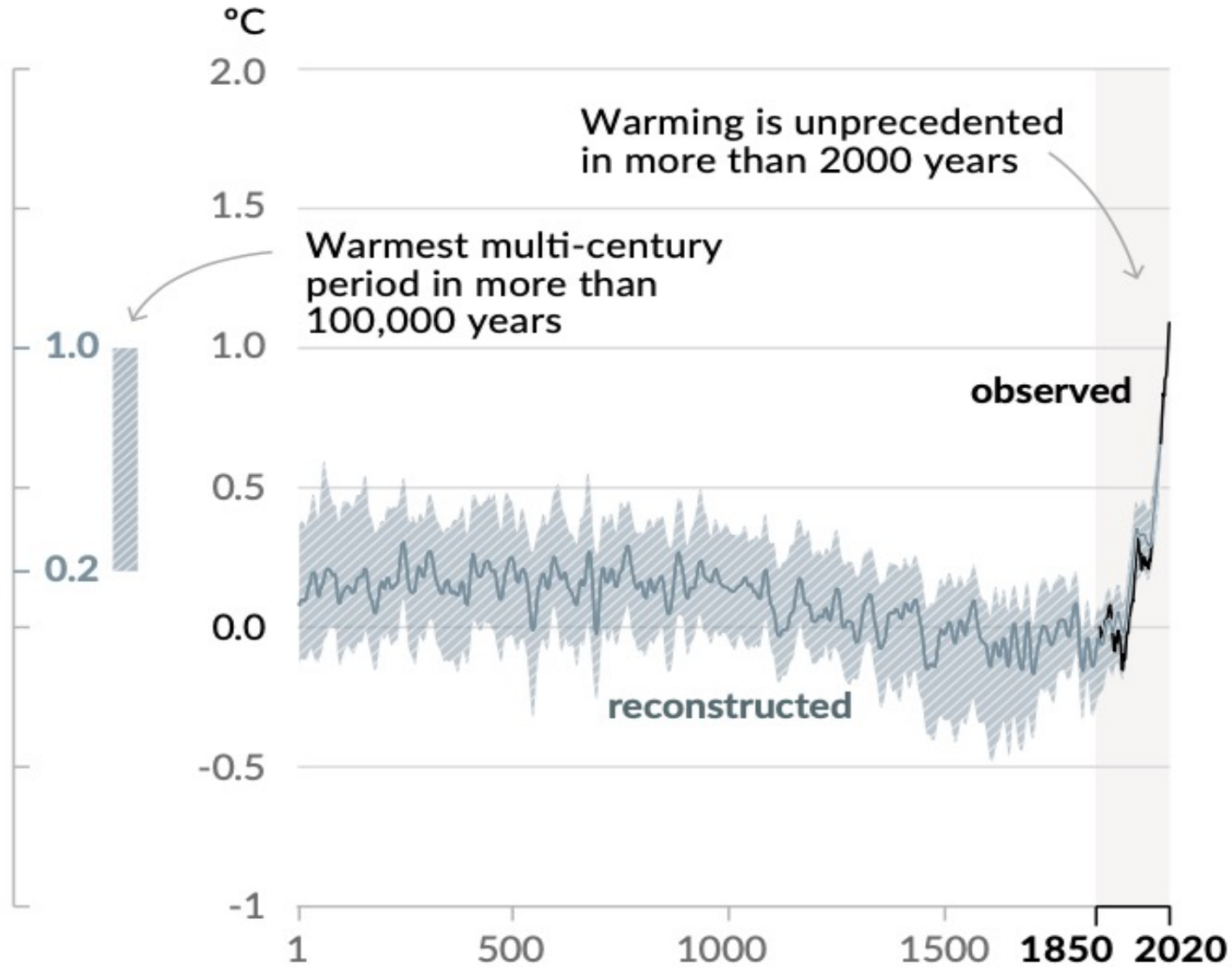
The 6th Assessment Report of IPCC

Natassa Romanou

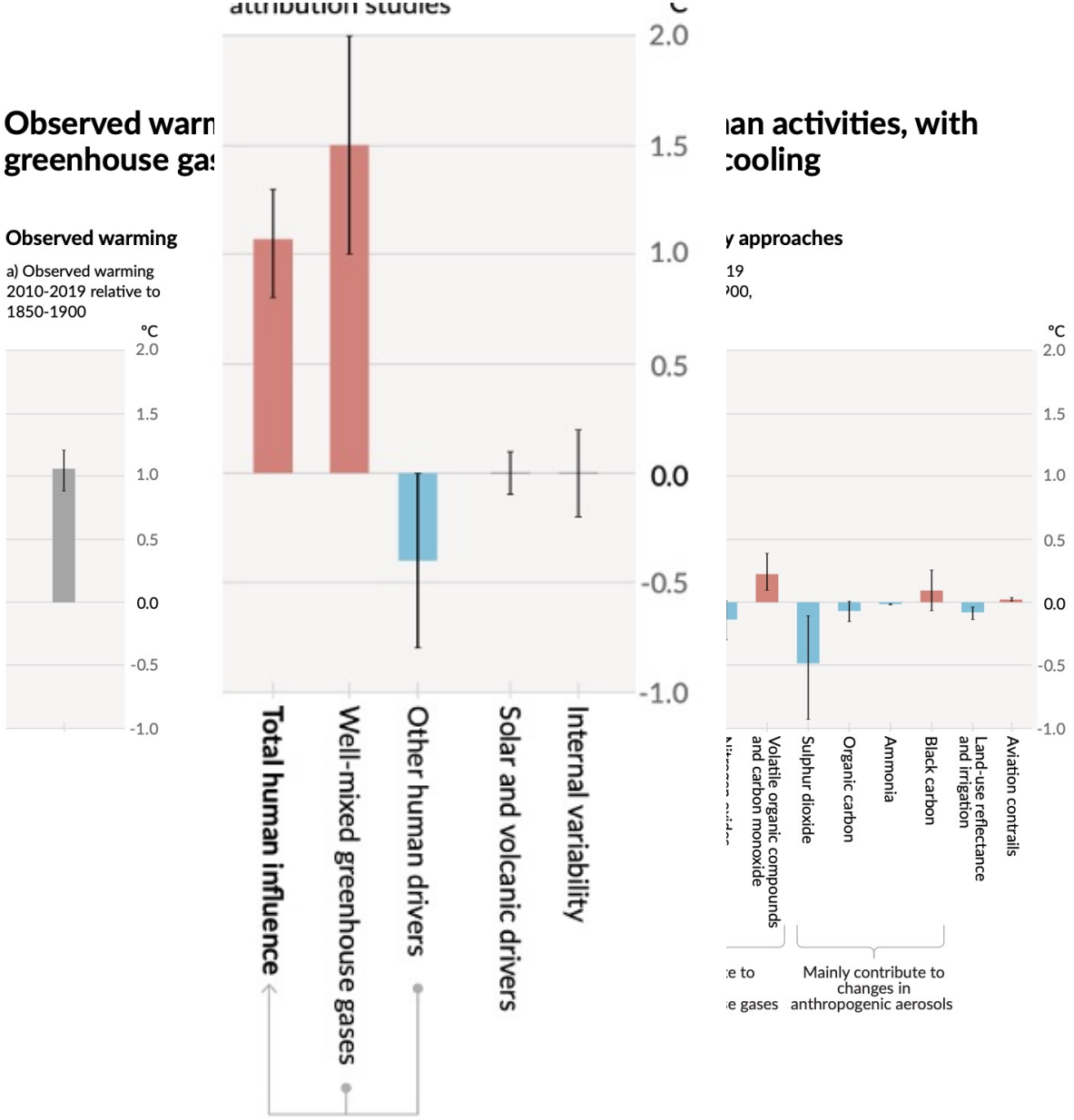
Columbia U./NASA-Goddard Institute for Space Studies

Global Warming:

temperature change from late 19th Century

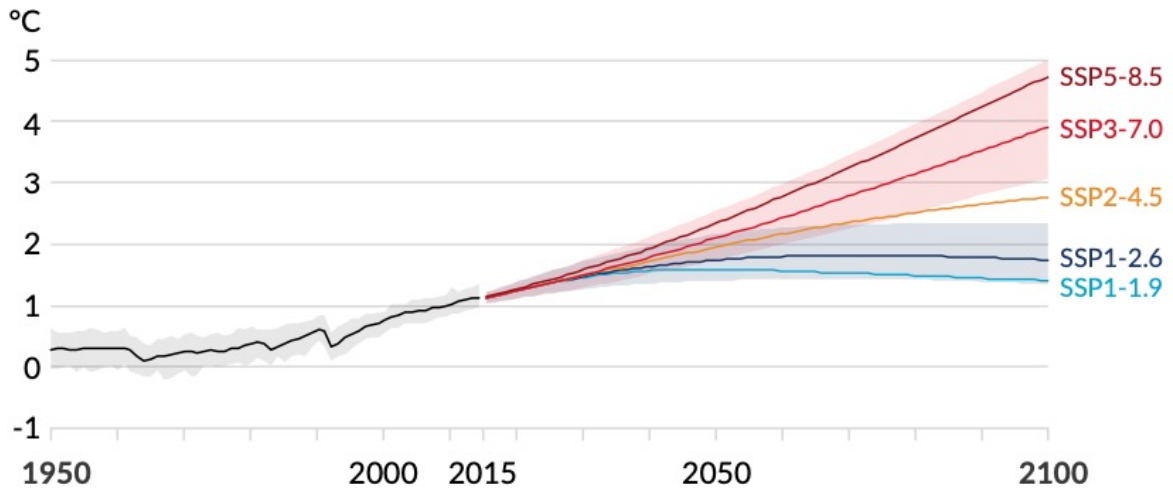


Attribution of global warming

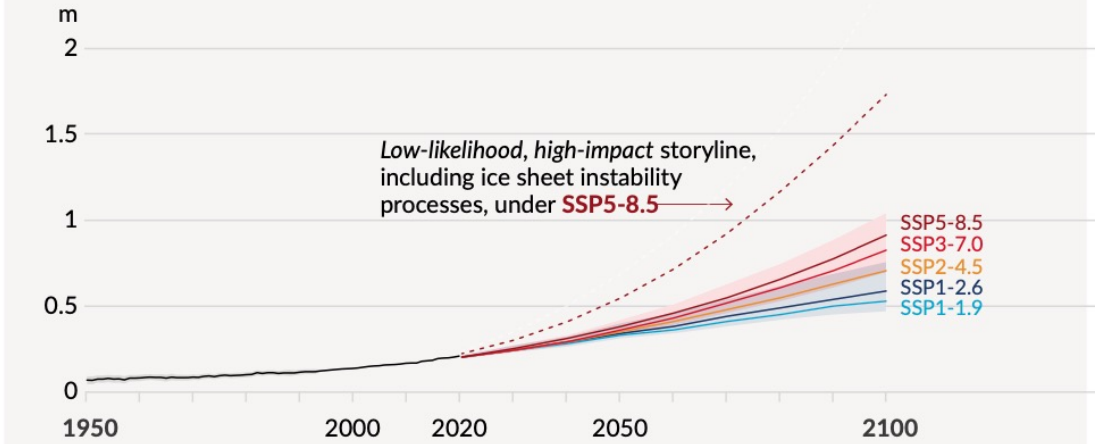


Projections:
Change relative to late 19th Century

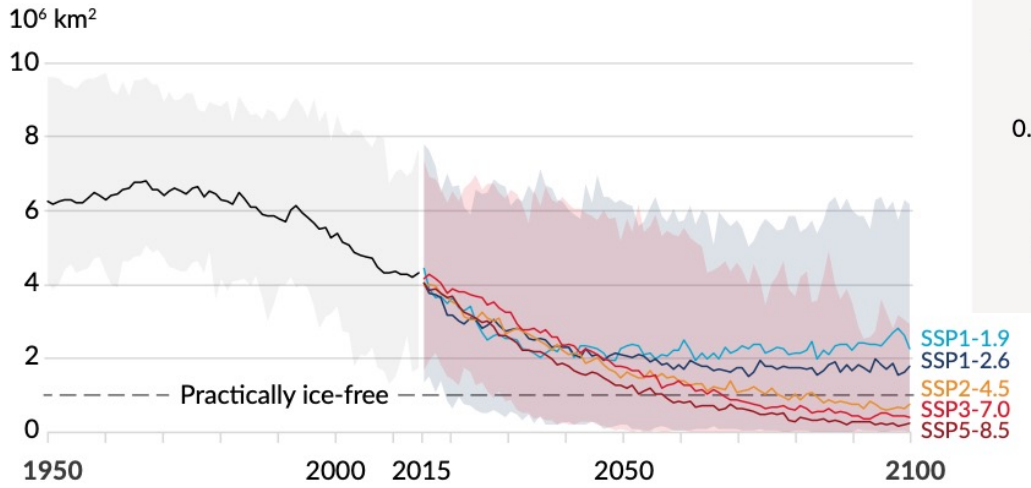
Temperature change



Global Sea level (change)

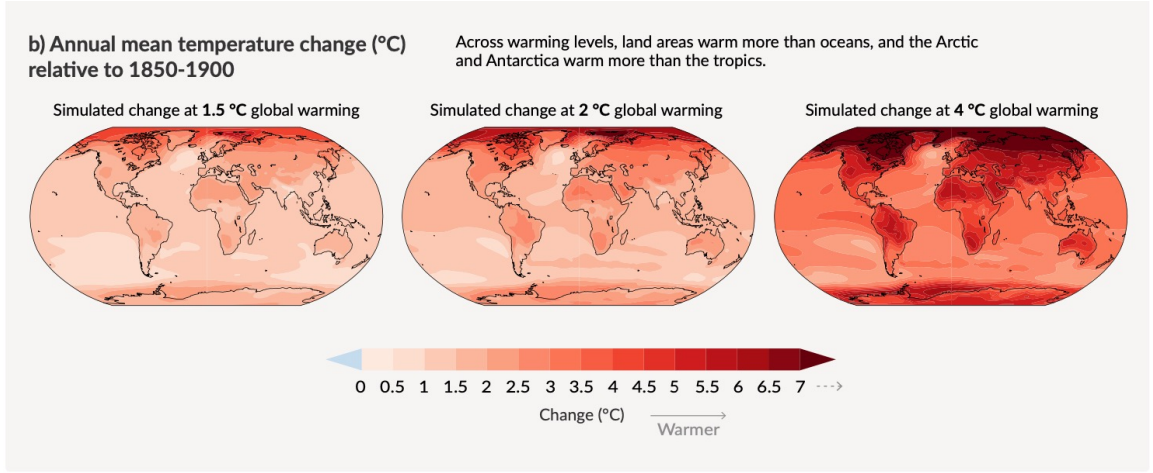


Arctic Sea Ice area

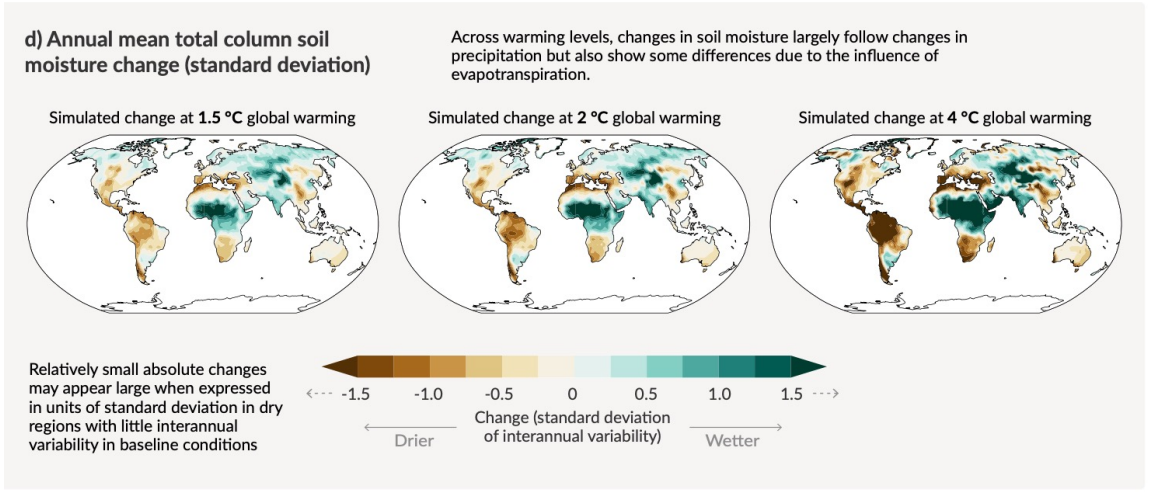


Projections: Regional scales

Surface Temperature

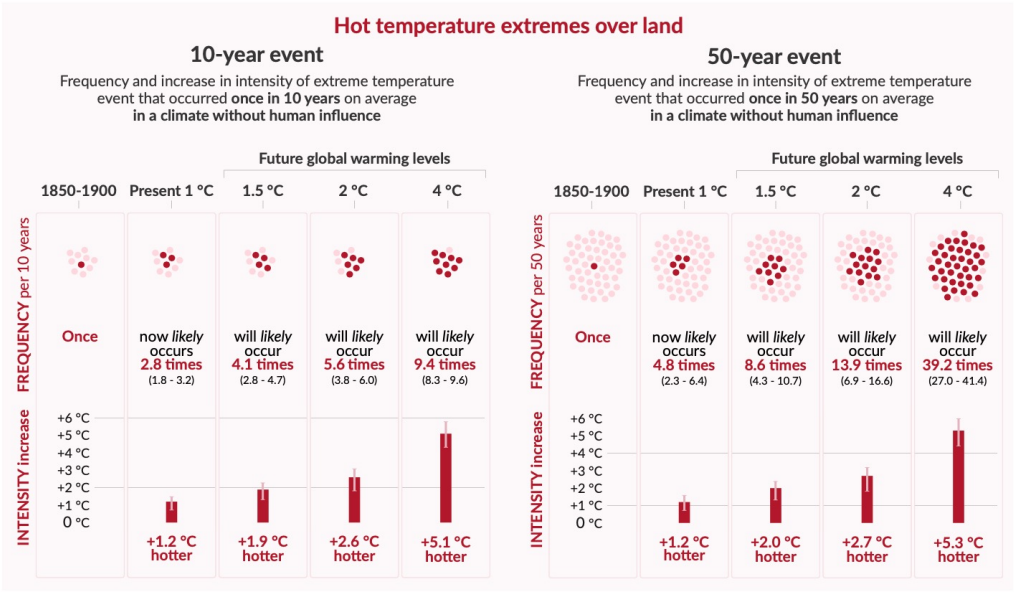


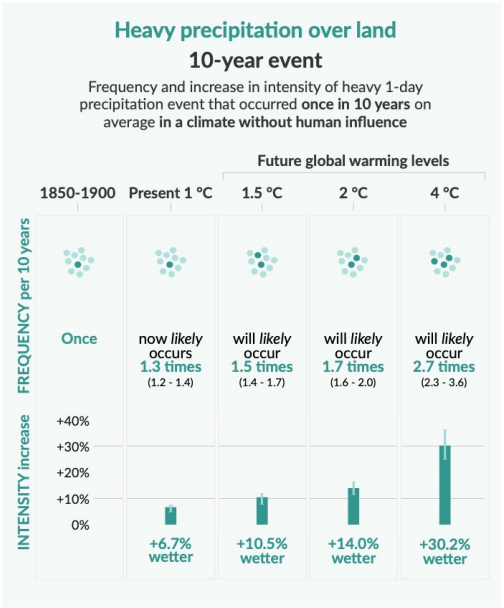
Soil Moisture

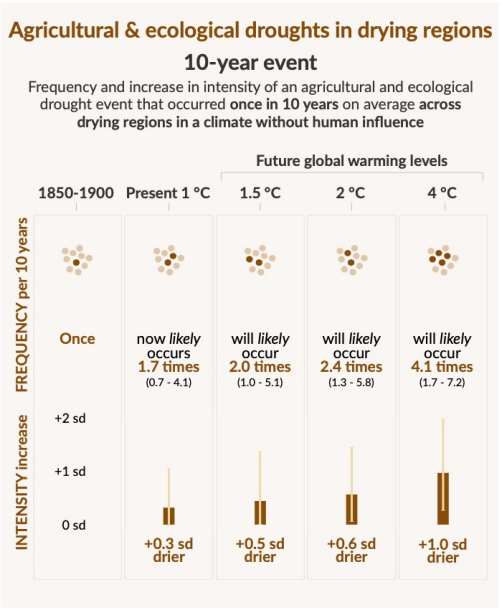


Extremes: the new "norm"

Projected changes in extremes are larger in frequency and intensity with every additional increment of global warming

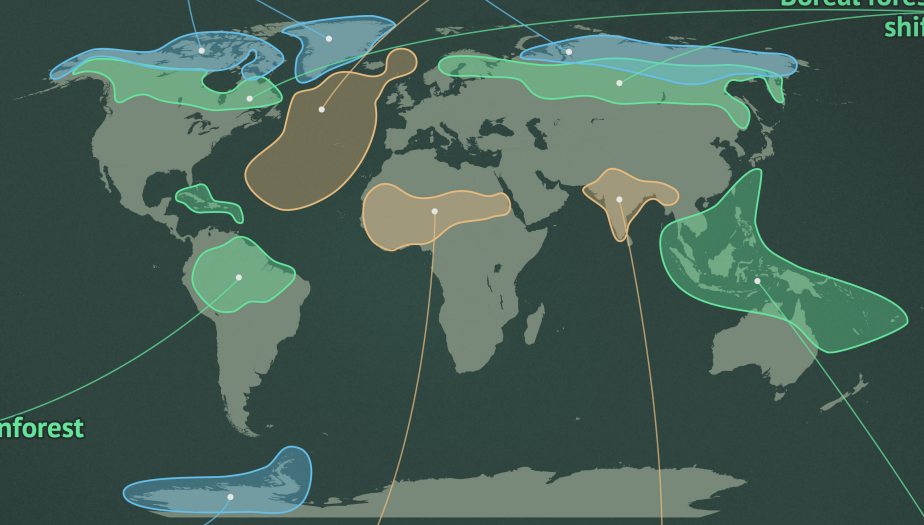






TIPPING POINTS

Nine climate "tipping points" where rising global temperatures could push parts of the Earth system into irreversible change



Greenland ice sheet disintegration
Irreversible retreat of the ice sheet caused by rising temperatures
Sea level rise (2-7m)

Permafrost loss
Abrupt increase in emissions of CO_2 and methane through the thawing of frozen carbon-rich soils
Greenhouse gas release
Amplified warming

Atlantic meridional overturning circulation breakdown
Shutdown of the AMOC caused by an increased influx of freshwater into the North Atlantic
Regional cooling
Sea level rise

Boreal forest shift
A shift in boreal forests, seeing expansion into tundra to the north and dieback to the south
Ecological shift
Regional warming

Tipping points
Impacts

Amazon rainforest dieback
Deforestation and hotter, drier conditions causing dieback of the rainforest and a shift towards savannah
Biodiversity loss
Decreased rainfall

West Antarctic ice sheet disintegration
Collapse of the ice sheet triggered by persistent grounding-line retreat in one sector, cascading to other sectors
Sea level rise (5m)

West African monsoon shift
An abrupt change in Sahel rainfall, caused by a shift northwards (wetter) or southwards (drier) in the West African monsoon
Ecosystem change

Indian monsoon shift
The monsoon system could be weakened by higher aerosol emissions or strengthened by rising CO_2 emissions
Decreased carrying capacity
Drought

Coral reef die-off
Rising temperatures pushing corals beyond tolerable levels of thermal stress into an alternative state dominated by macroalgae
Ecological change

- Melting
- Biome shift
- Circulation change

Infographic by Rosamund Pearce/Tom Prater

CarbonBrief
CLEAR ON CLIMATE

What is different and what is still unknown & limitations

- Differences
  - Confidence levels
  - Methane, nitrous oxides
  - Smaller spatial and temporal scales: continent, larger regions, decades
  - Extremes
  - Tipping points
  - 1.5C threshold much closer than we thought

- Unknowns:
  - Local smaller scales, and decadal time scales
  - ice sheets & other tipping points
  - interactions between the biology and the physical climate; land use changes

- Limitations:
  - Lowest common denominator, consensus, a reticent scientific community?

What is upcoming

- IPCC AR4 other reports
  - WGII Impacts, Adaptation and Vulnerability
  - WGIII Mitigation of Climate Change

- Societal Impacts

Climate change is a crisis multiplier

- Unemployment (esp precarious workers, women & youth),
- Housing crisis and land grab
- Food and water scarcity
- Diseases, medical emergency (elderly, people w/ disabilities)
- Social-economic Inequality
- Migration (climate refugees, internal or cross border)
- Democratic deficit –lack of participatory control of government actions and policies

Broader Question to consider is

Which tipping point will come first? Climate tipping point or biodiversity/societal tipping point?