

SIBILITY

IRREVER

REVER

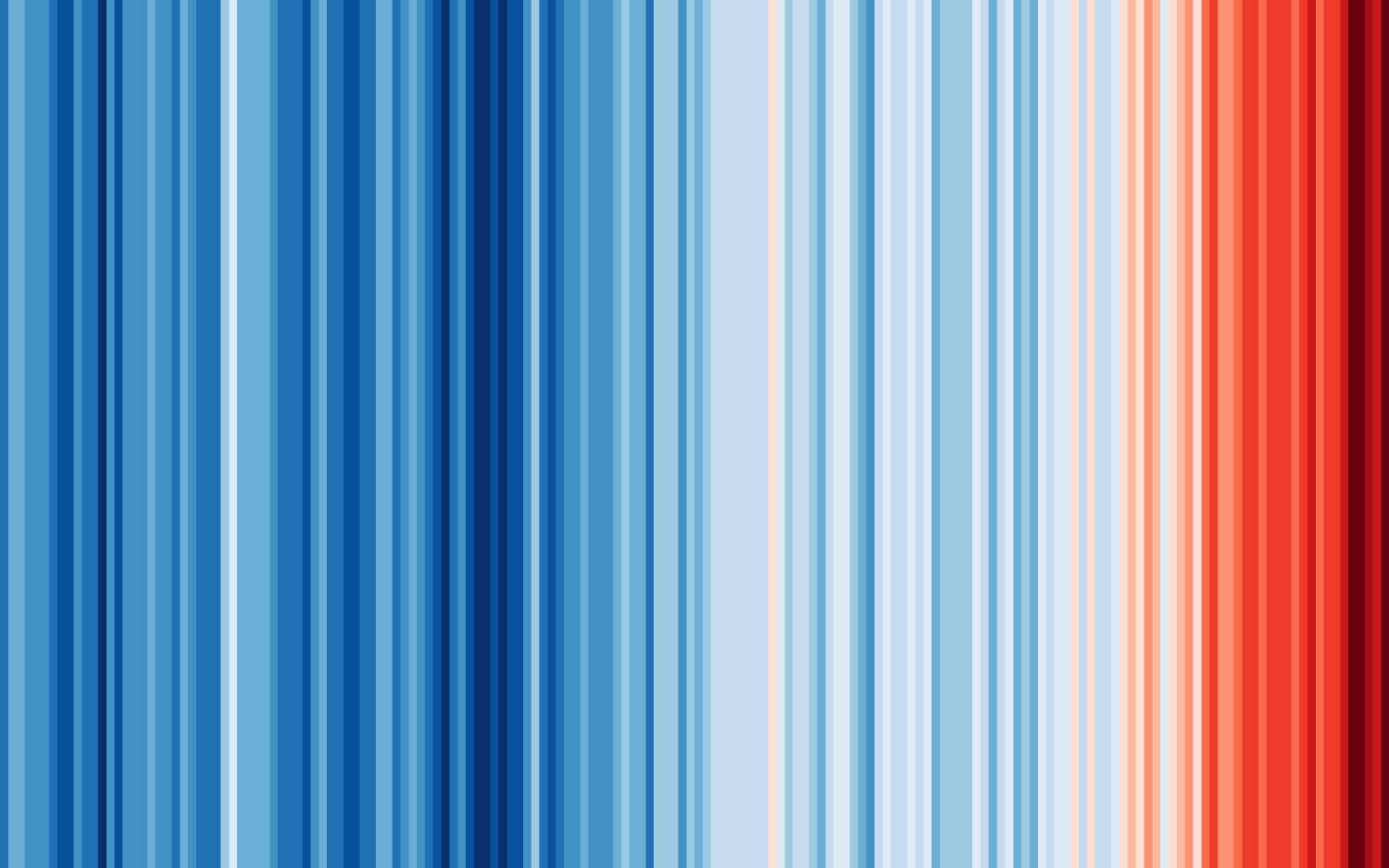
SIBILITY



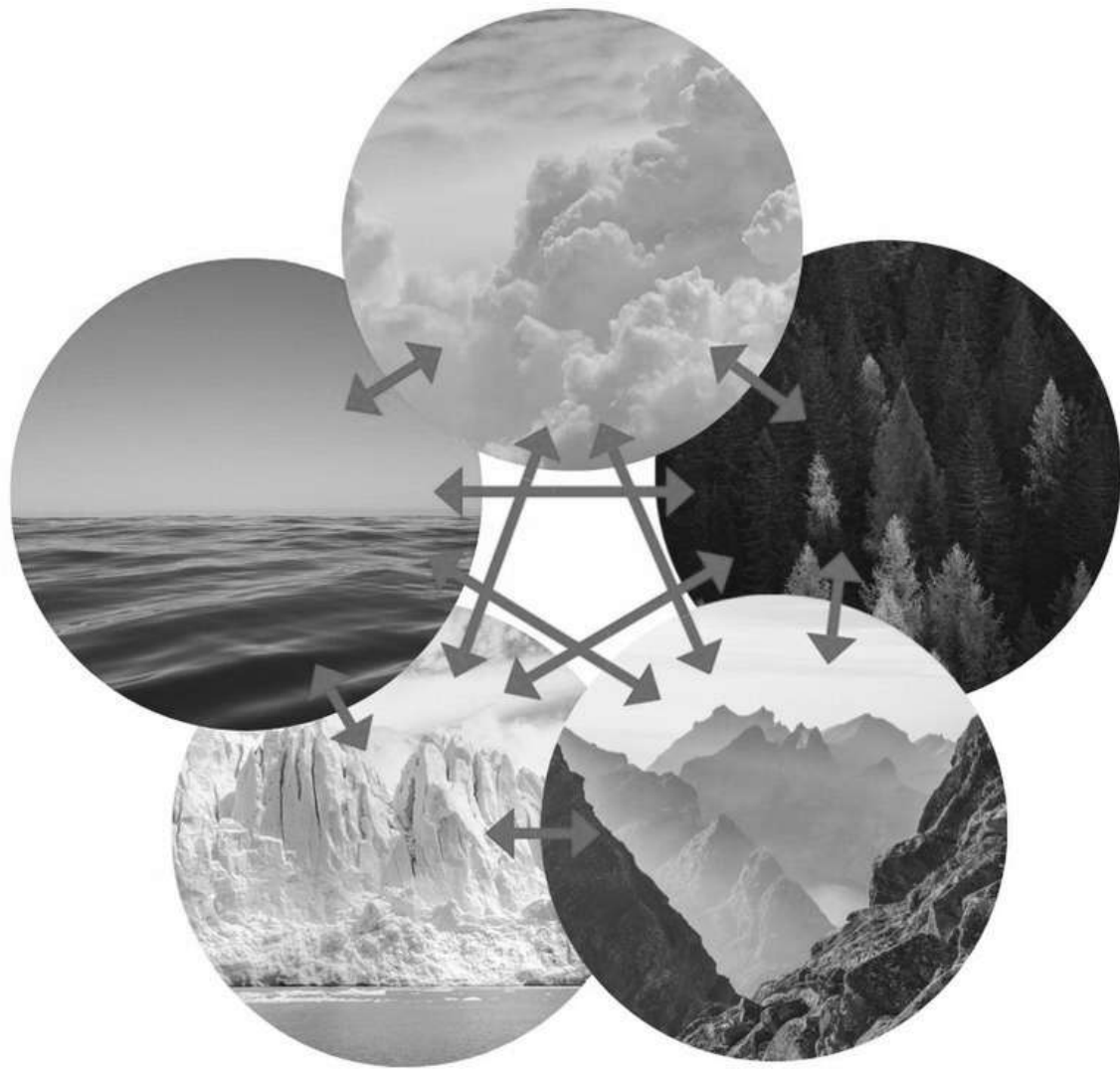
1920s



2012

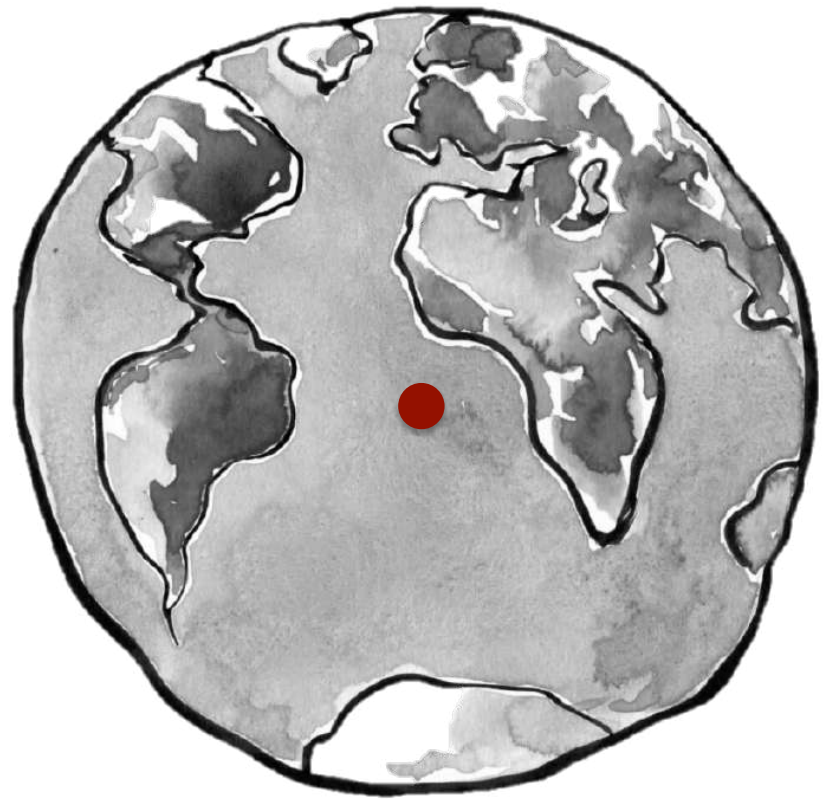


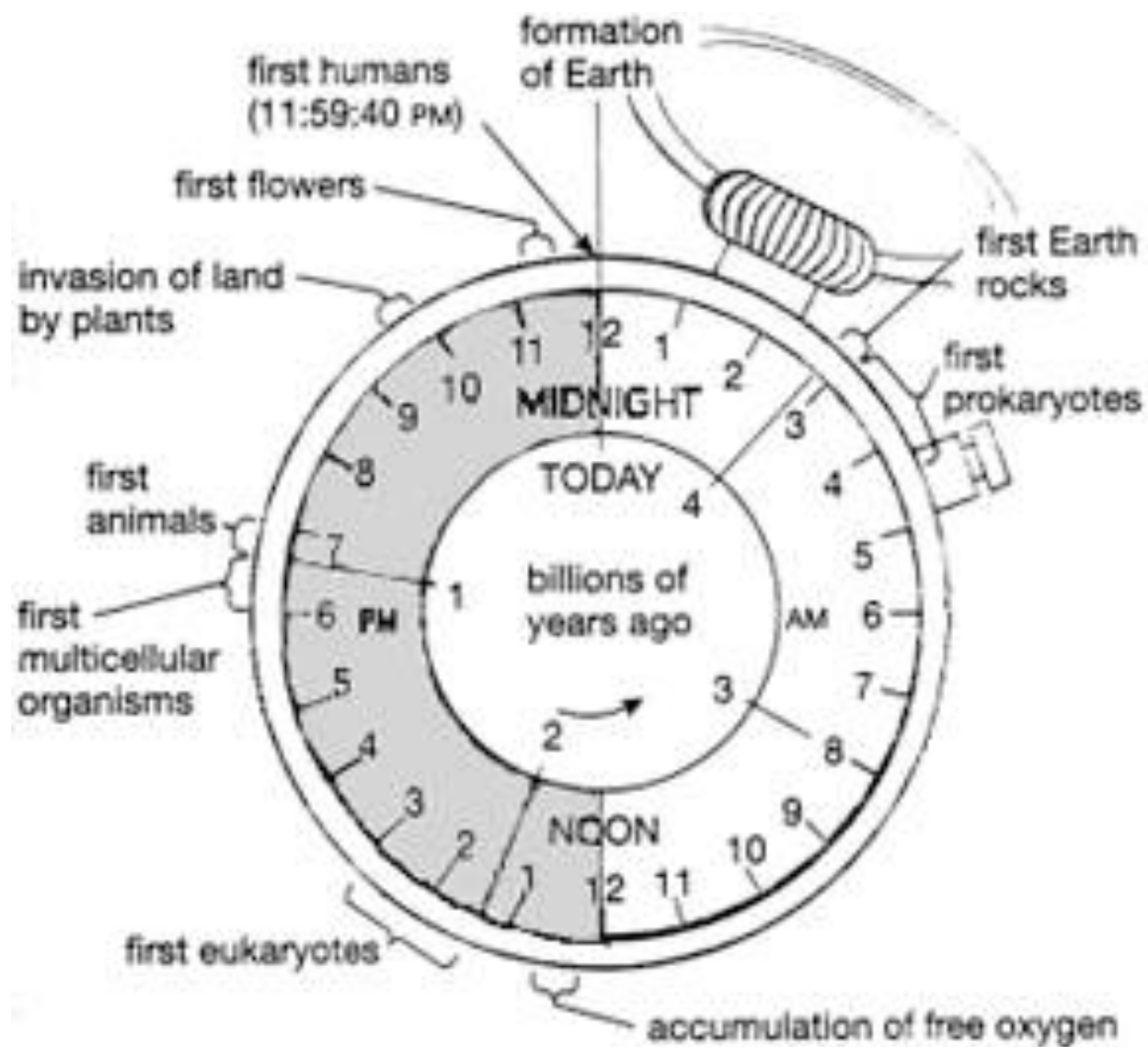


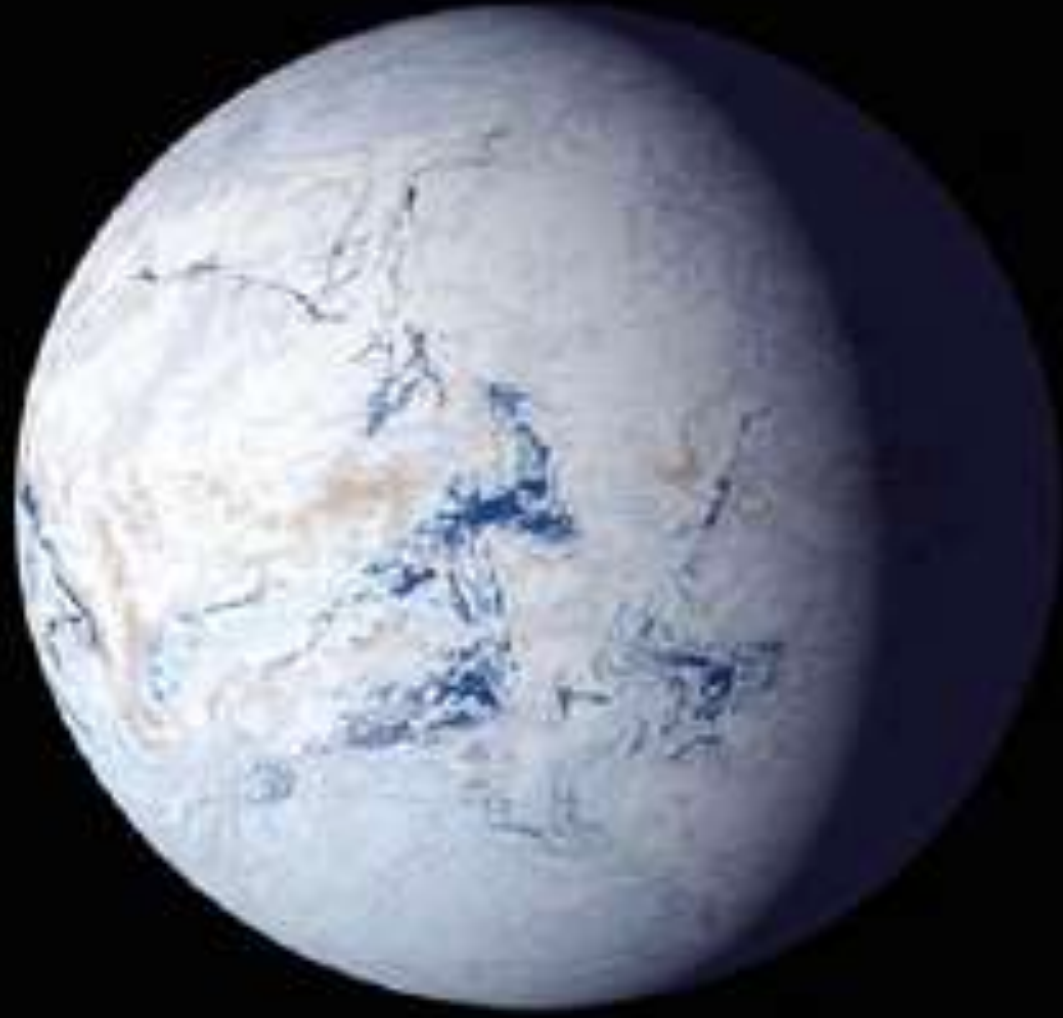


What is the nature of these interactions and the behaviour of the climate system with respect to (ir)reversibility?

- Time's Arrow compared to Time's Cycle in natural systems
- What is the relevant timescale of interest for assessing (ir)reversibility?
- Does reversibility have to be via the same pathway?
- Some specific terminology and challenges in climate science
- How could these things matter in the context of social action on climate change?



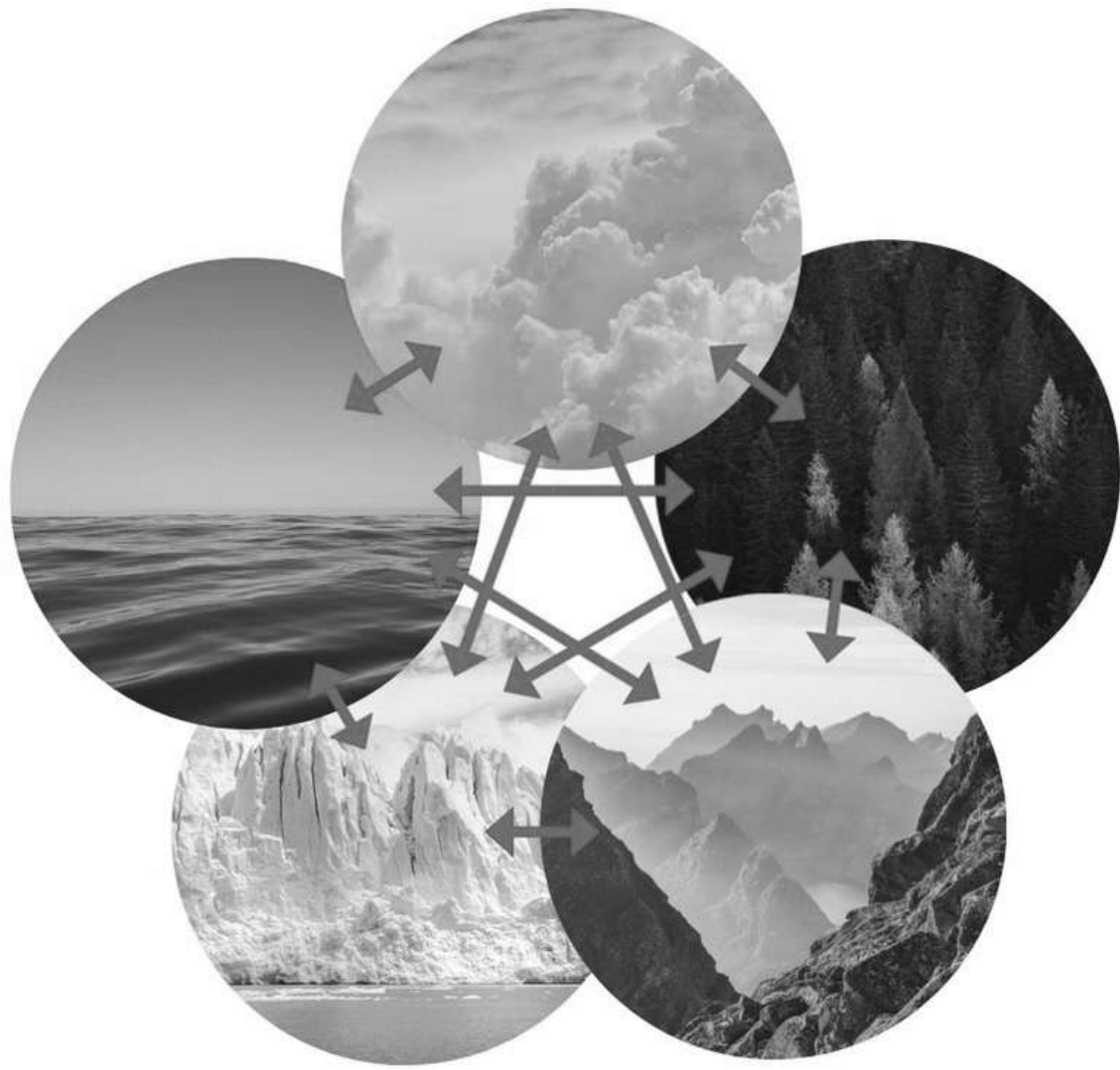




800 million years ago



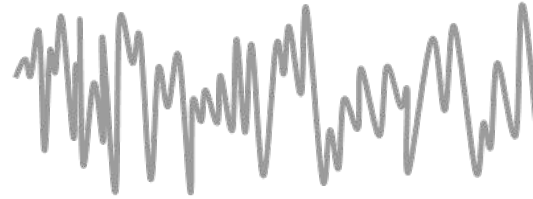
100 million years ago



forcing

effect (δT_s)

internal variability



„noise“

cyclic

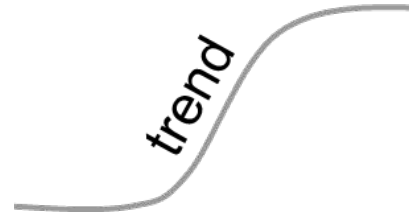
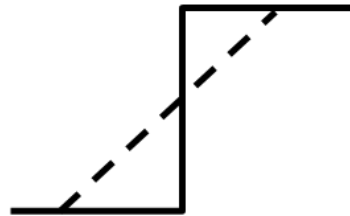


episodic

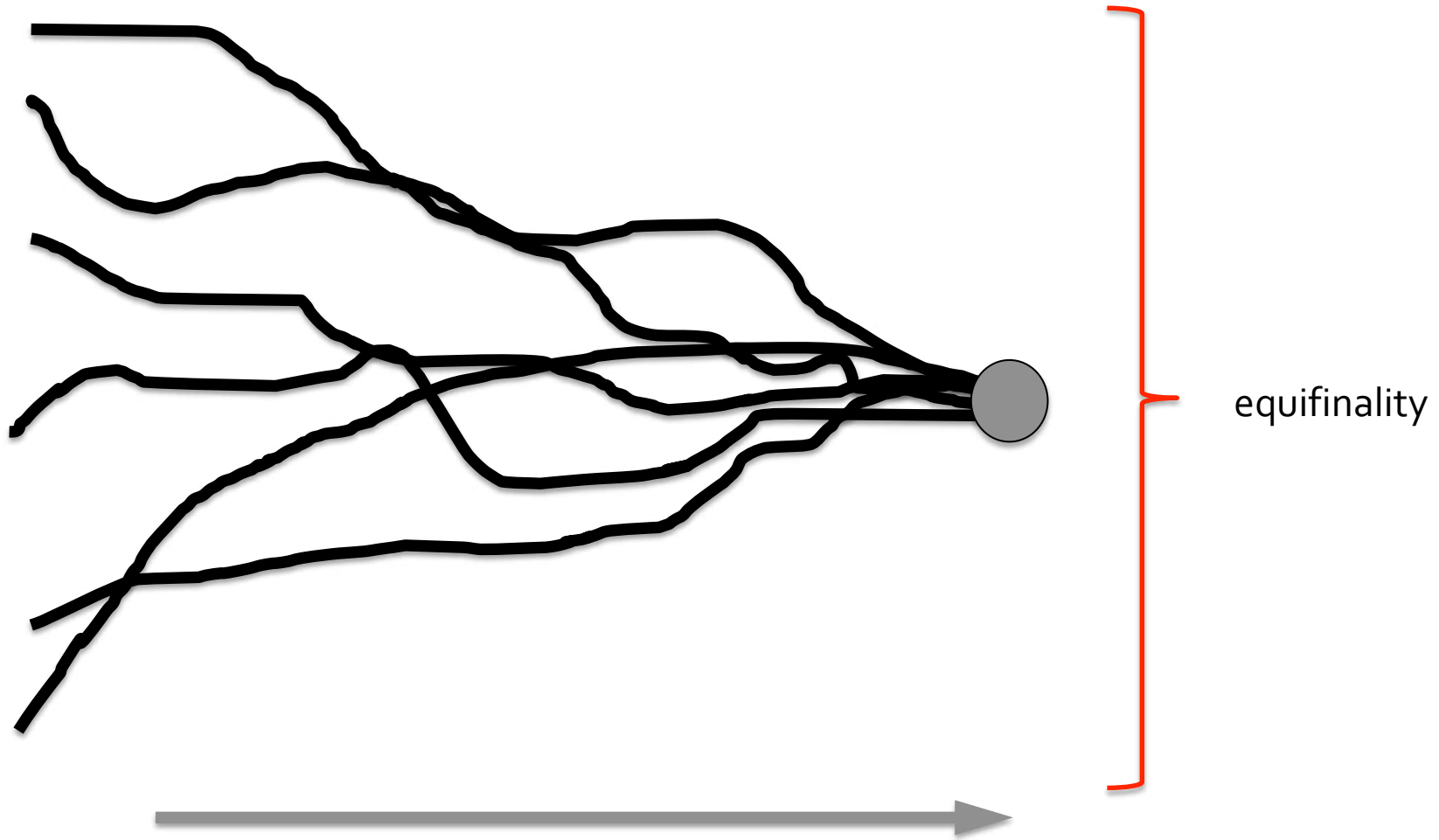


fluctuation

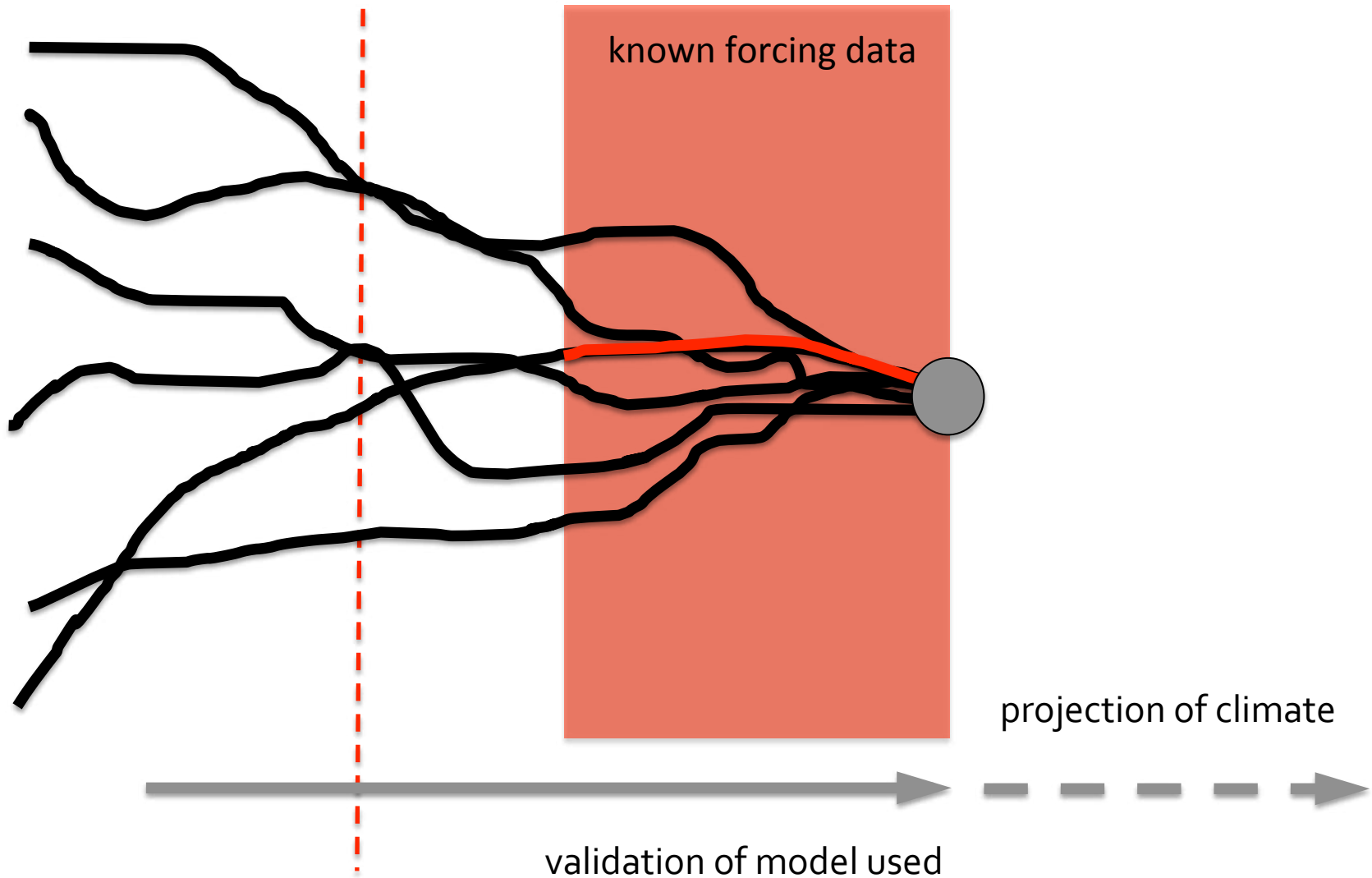
stepwise/
persistent

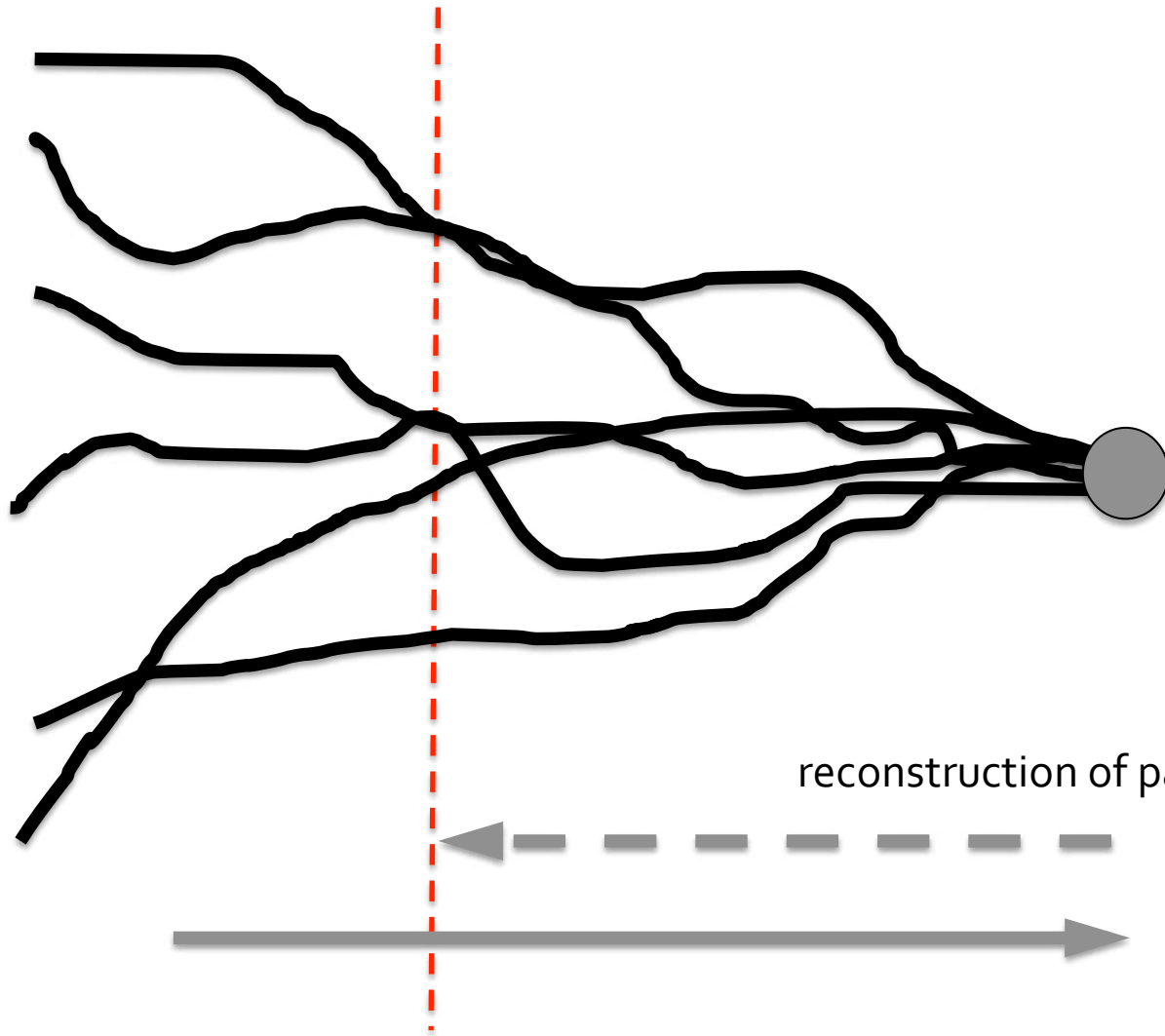


change

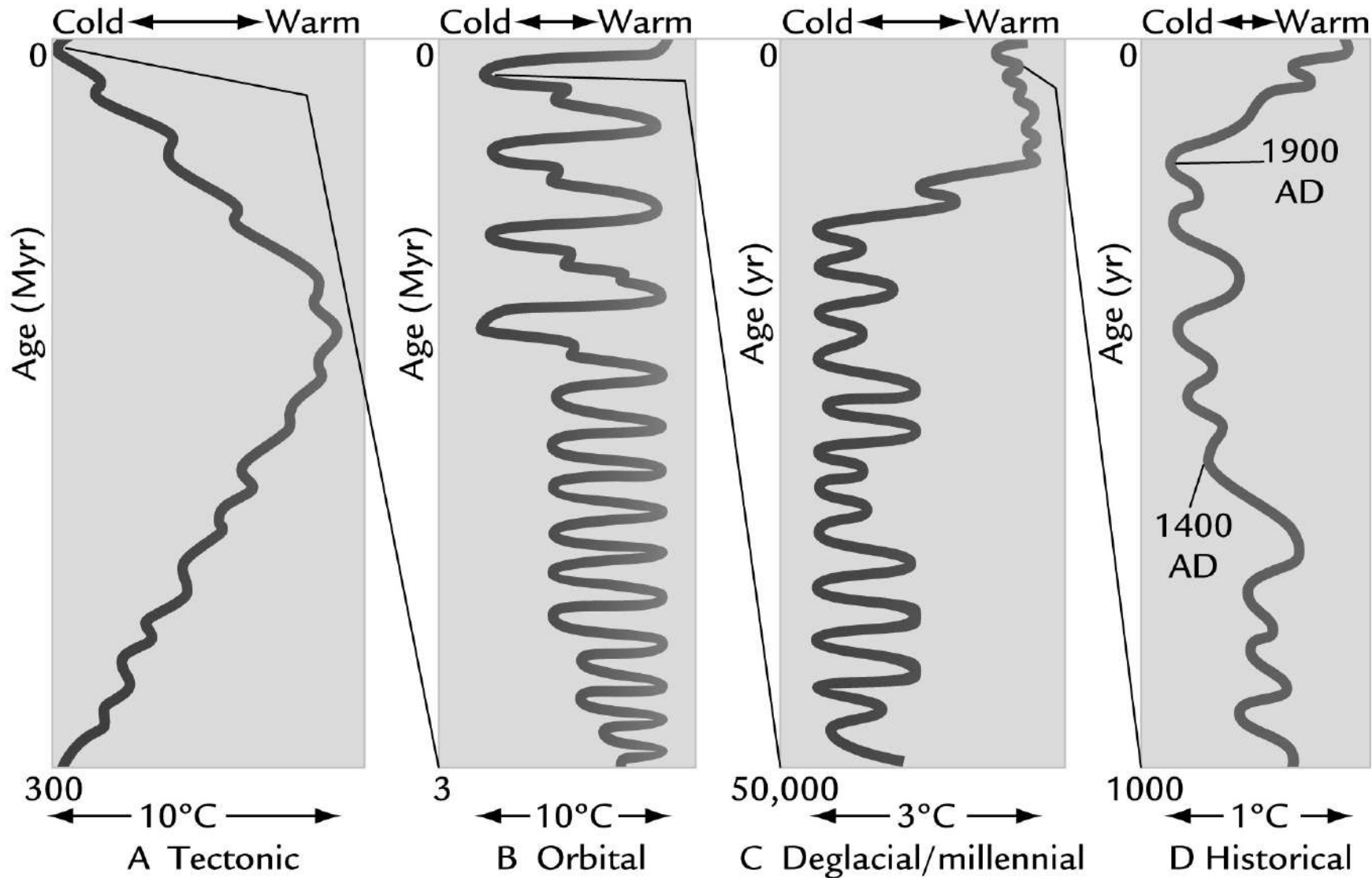


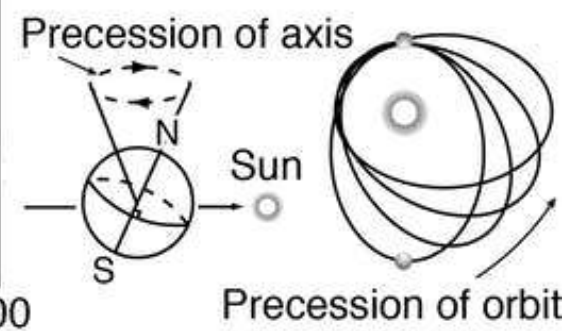
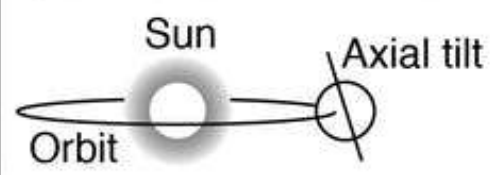
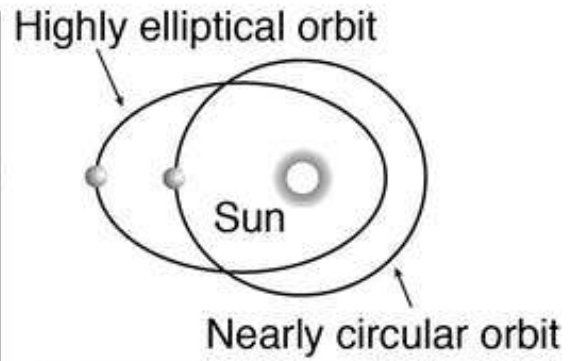
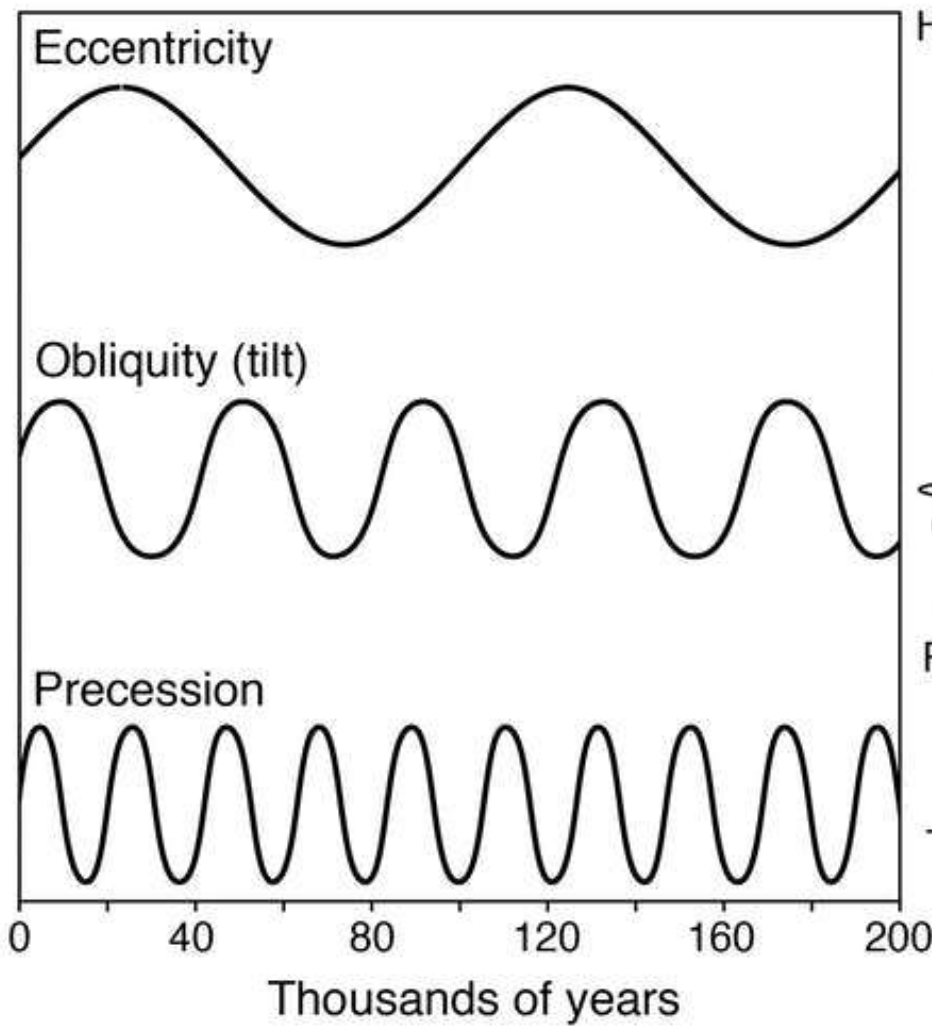


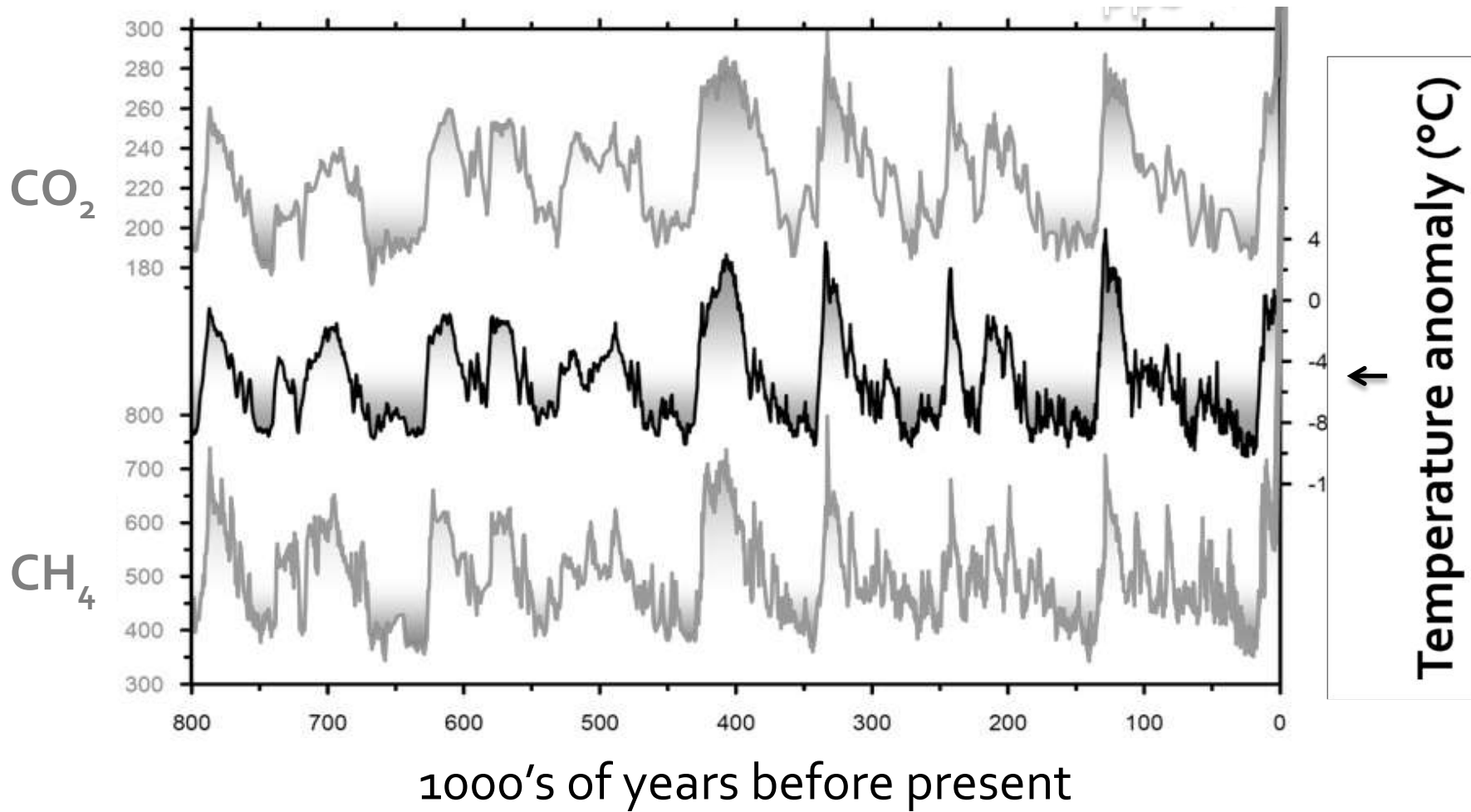




reconstruction of past climate conditions







Spatial non-symmetry

Process hysteresis

Cascades

Feedbacks

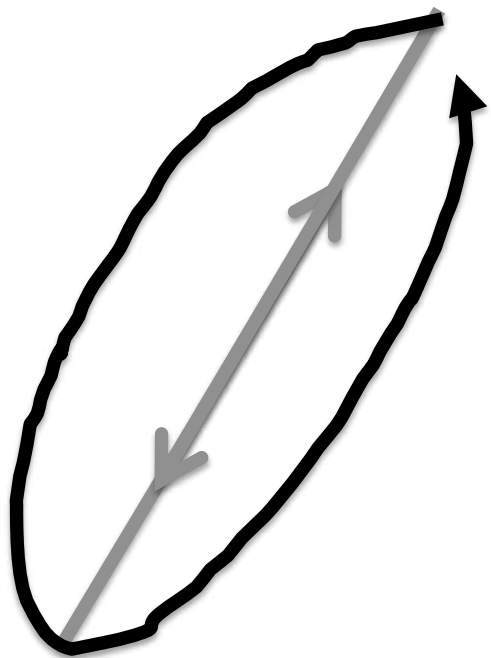
Tipping points

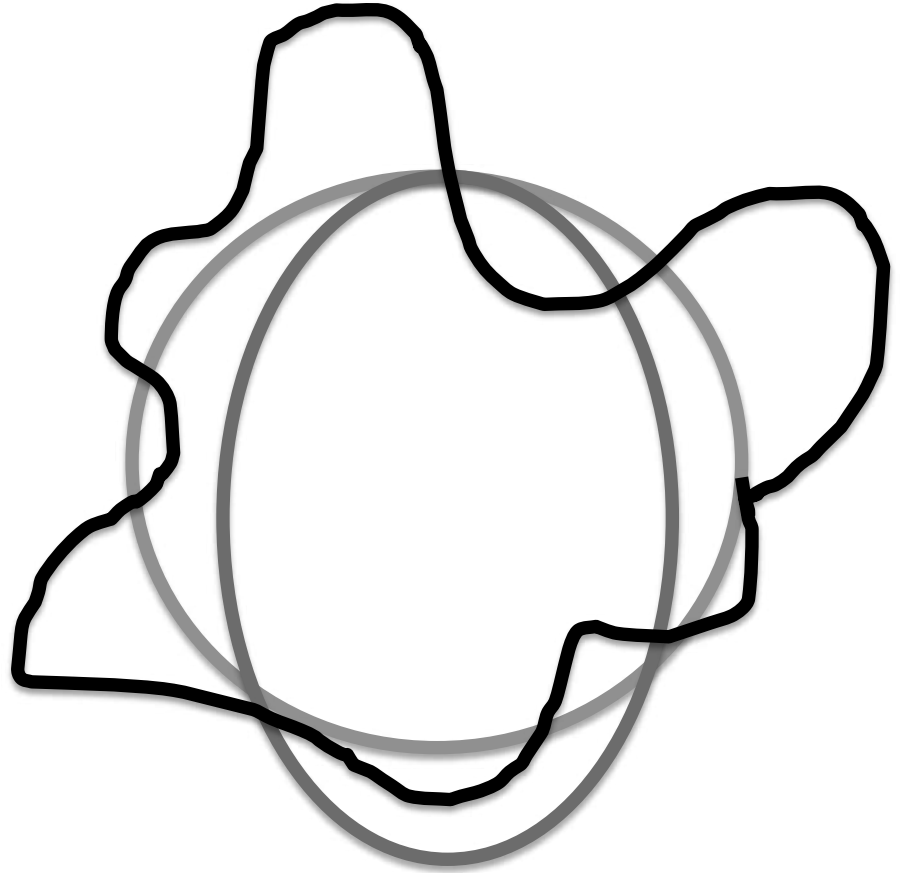
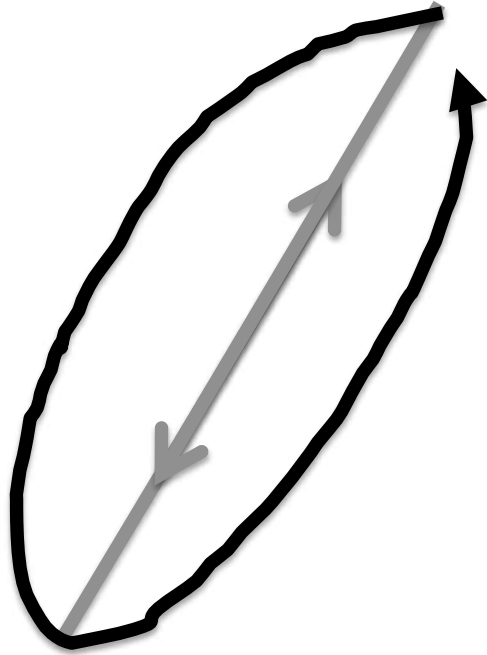


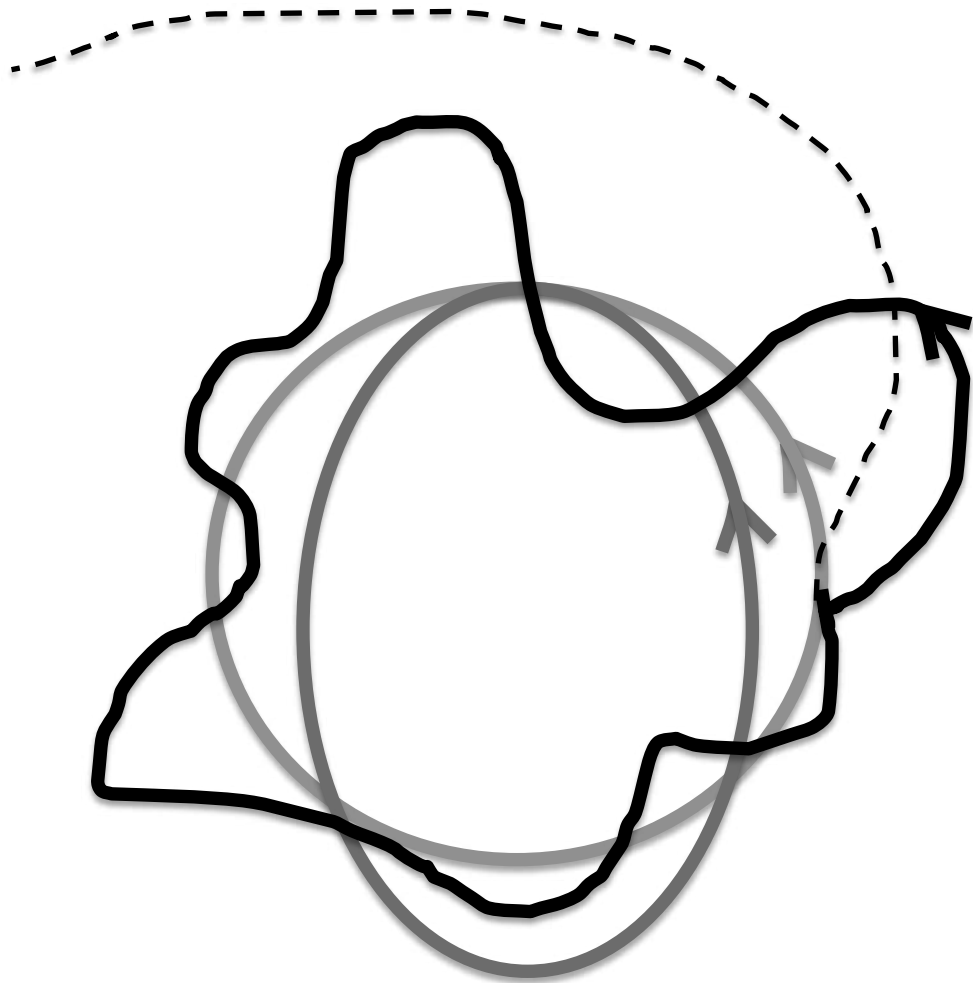
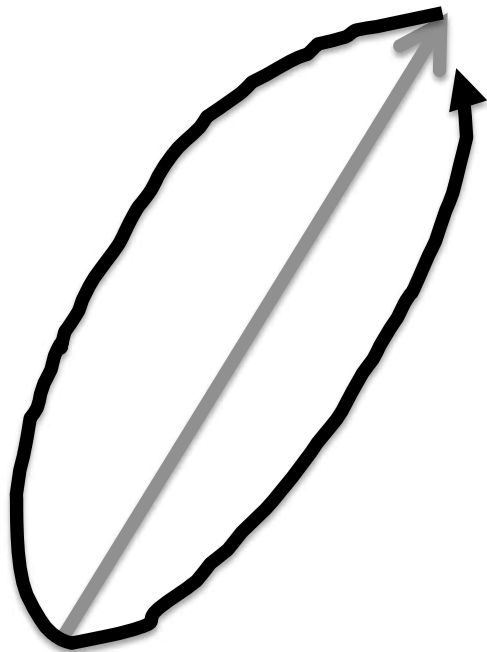
Hysteresis is the dependence of the state of a system on its history.

This can happen internally to a part of the system (e.g. glaciers do not grow and decay in a symmetrical way, even if the boundary conditions are symmetrical).

This can happen as a result of knock-on effects or feedbacks in related parts of the system (e.g. glaciers erode the underlying bedrock so a glacier going through advance/retreat cycles has a different geometry even if climate is the same)

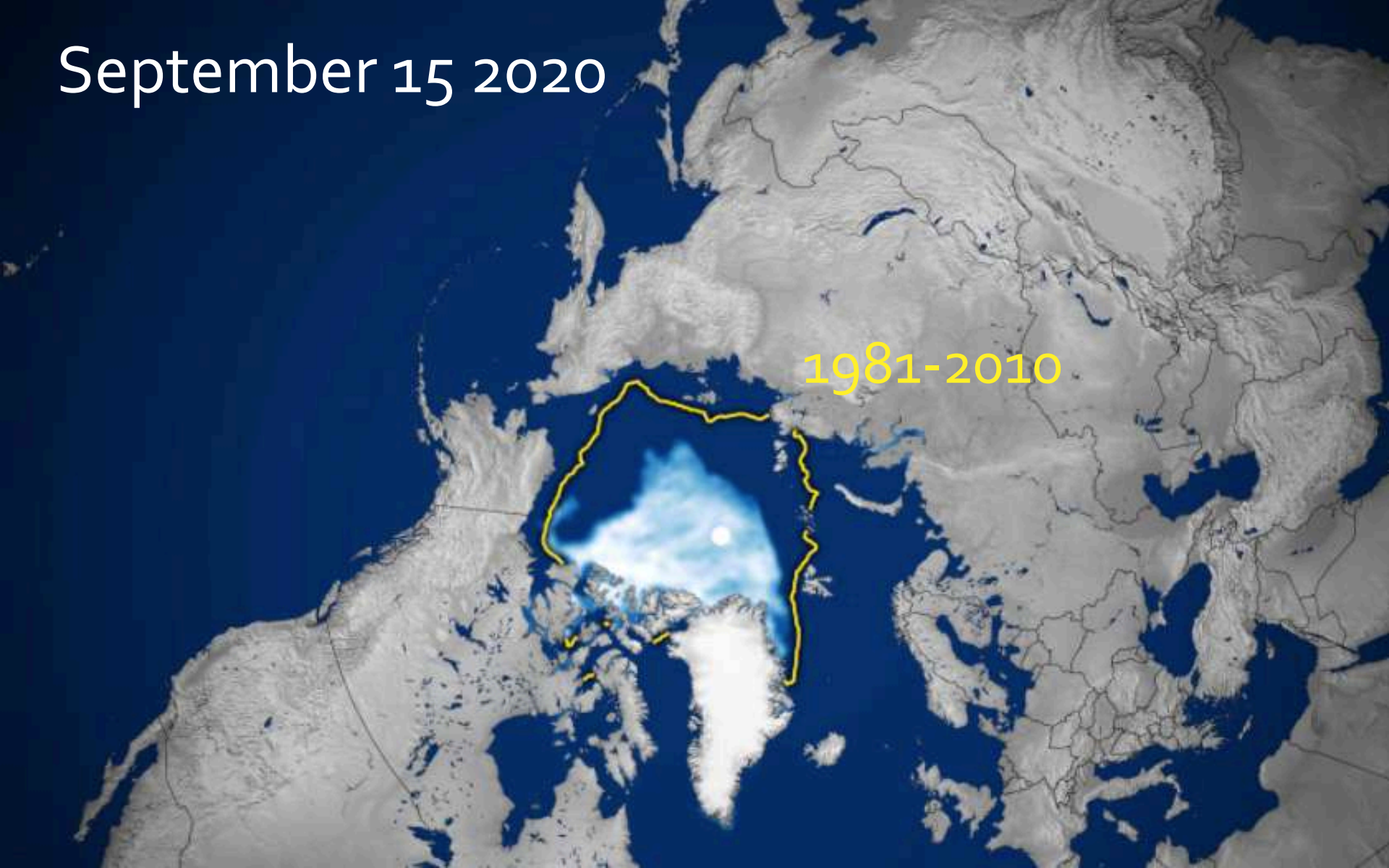






September 15 2020

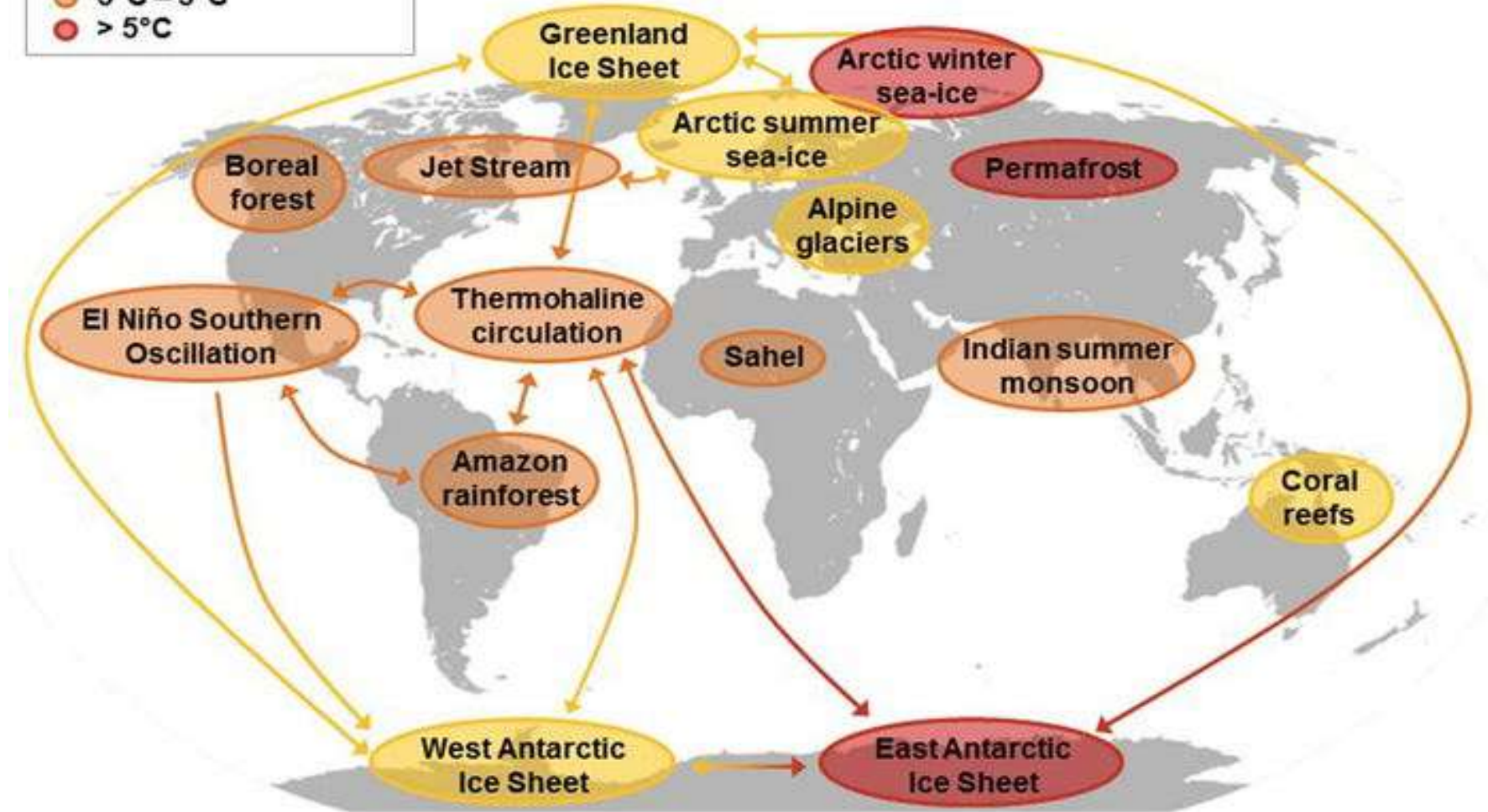
1981-2010



The Intergovernmental Panel on Climate Change (IPCC) defines **tipping points** as “critical thresholds in a system that, when exceeded, can lead to a significant change in the state of the system, often with an understanding that the change is irreversible.”

Tipping elements at risk:

- 1°C – 3°C
- 3°C – 5°C
- > 5°C





Greenland ice sheet would not regrow under current conditions



Alpine glaciers forecast to be all but gone by end of the century



1kg of concrete poured per m² of land surface
50% of land surface altered

1960 = 3.0 billion people
2020 = 7.8 billion people

burned about 40%
of known oil
reserves in 60
years ...

... took hundreds
of millions of years
to form



last time the concentration of CO₂ > **400 ppm** was 2.6 and 5.3 million years ago
(we evolved with mean CO₂ of **200 ppm**)

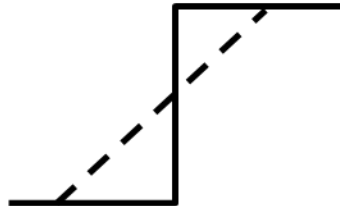
Every tonne of CO₂ emitted causes a linear increase in global temperature



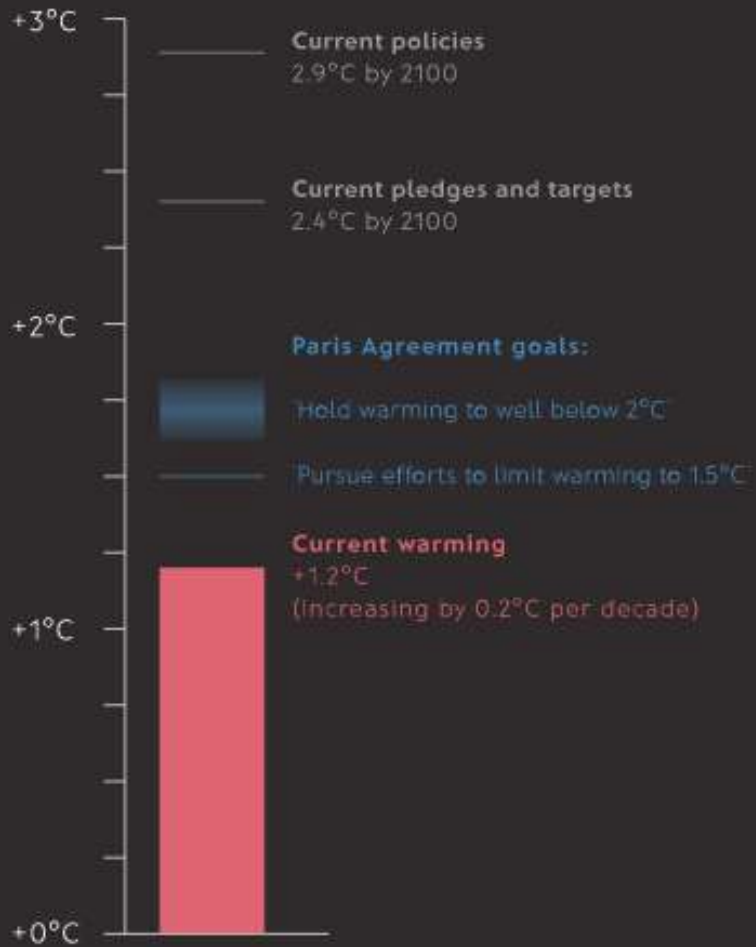
episodic



stepwise/
persistent



What are the causes of our collective lack of action on climate change?



Countries' current climate pledges are not enough to meet either of the Paris Agreement goals.

20-60 million USD annually on climate lobbying

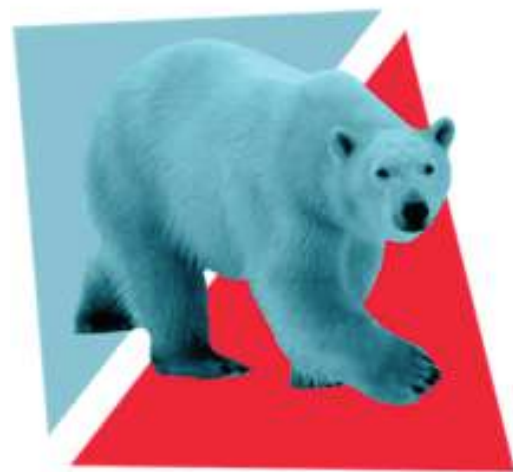




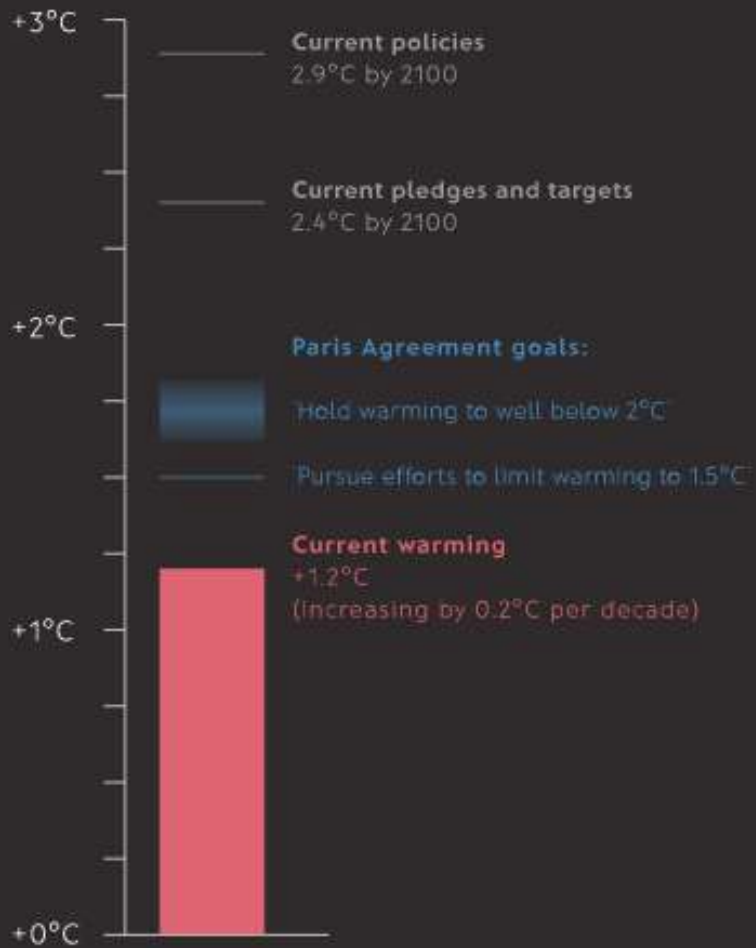
**Logical fallacies and a
dichotomized
perception of climate
action**



**Informational deficit
model**



**Spatial and Temporal
Dissonance**

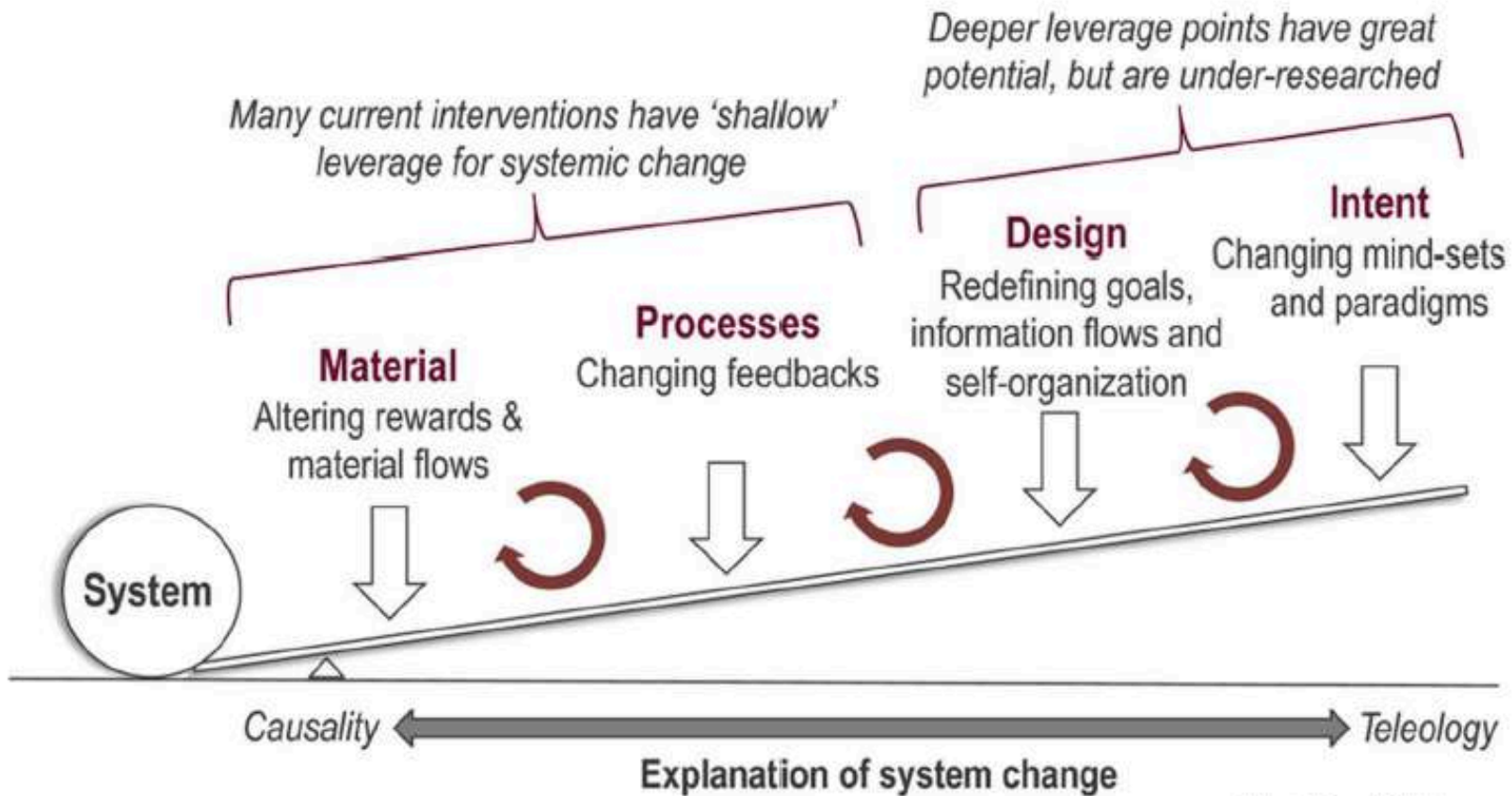


Countries' current climate pledges are not enough to meet either of the Paris Agreement goals.

What about the role of (ir)reversibility of anthropogenic climate change in our collective lack of action on climate change?

Either: you think its **reversible** and therefore no problem

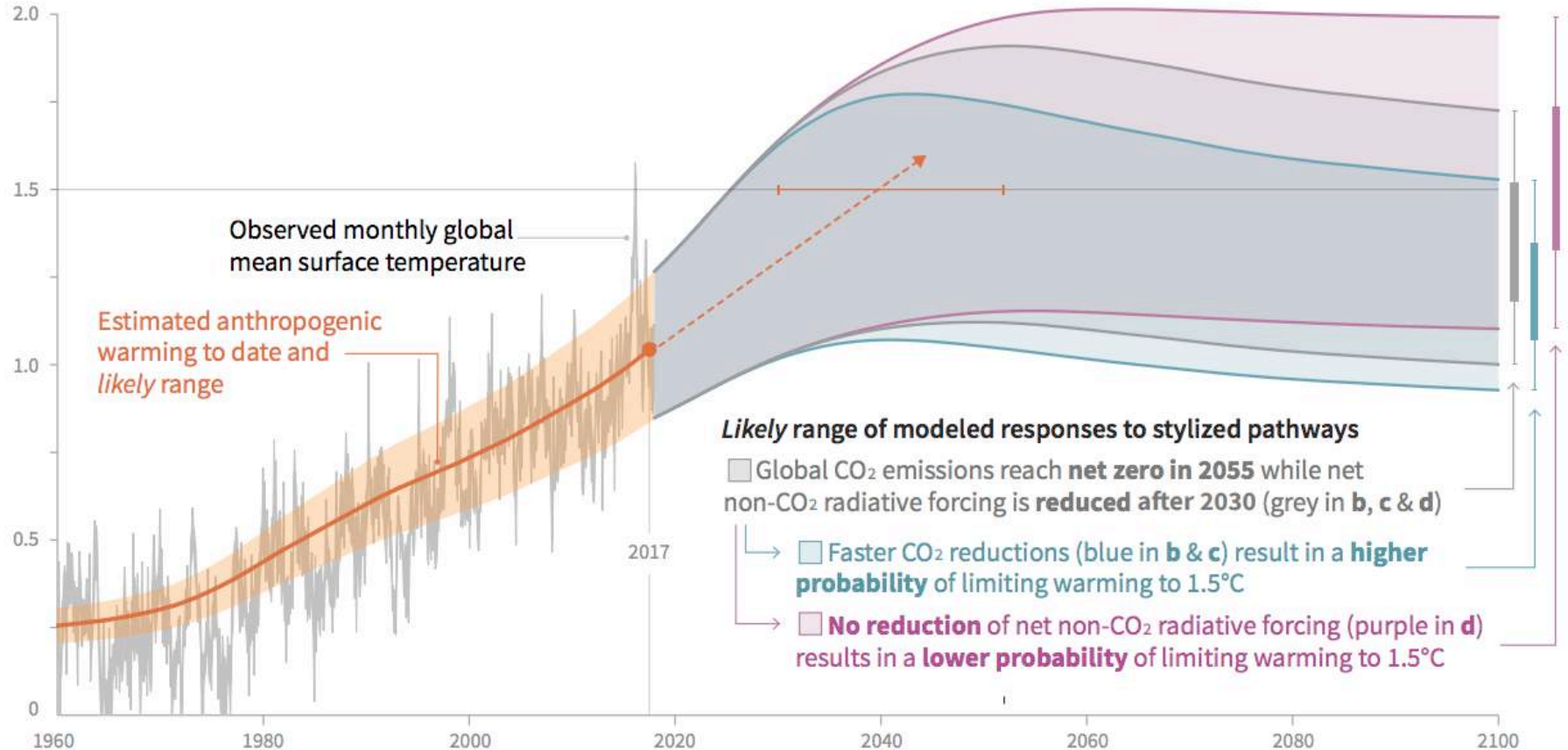
Or: you think its **irreversible** and therefore there is nothing to be done



Adapted from D.J. Abson

Partial, imperfect, reversibility as a means of owning our mess?

Global warming relative to 1850-1900 (°C)



IRREVERSIBILITY

Climate energetic state driven by earth's energy imbalance, but complexity via coupled systems operating at different timescales with cycling, thresholding and progressive change behaviours.

Factors relating to the irreversible:

Equifinality, hysteresis, tipping points, the timescale of interest

Relation between perceptions of (ir)reversibility
←→ climate inaction? To what extent