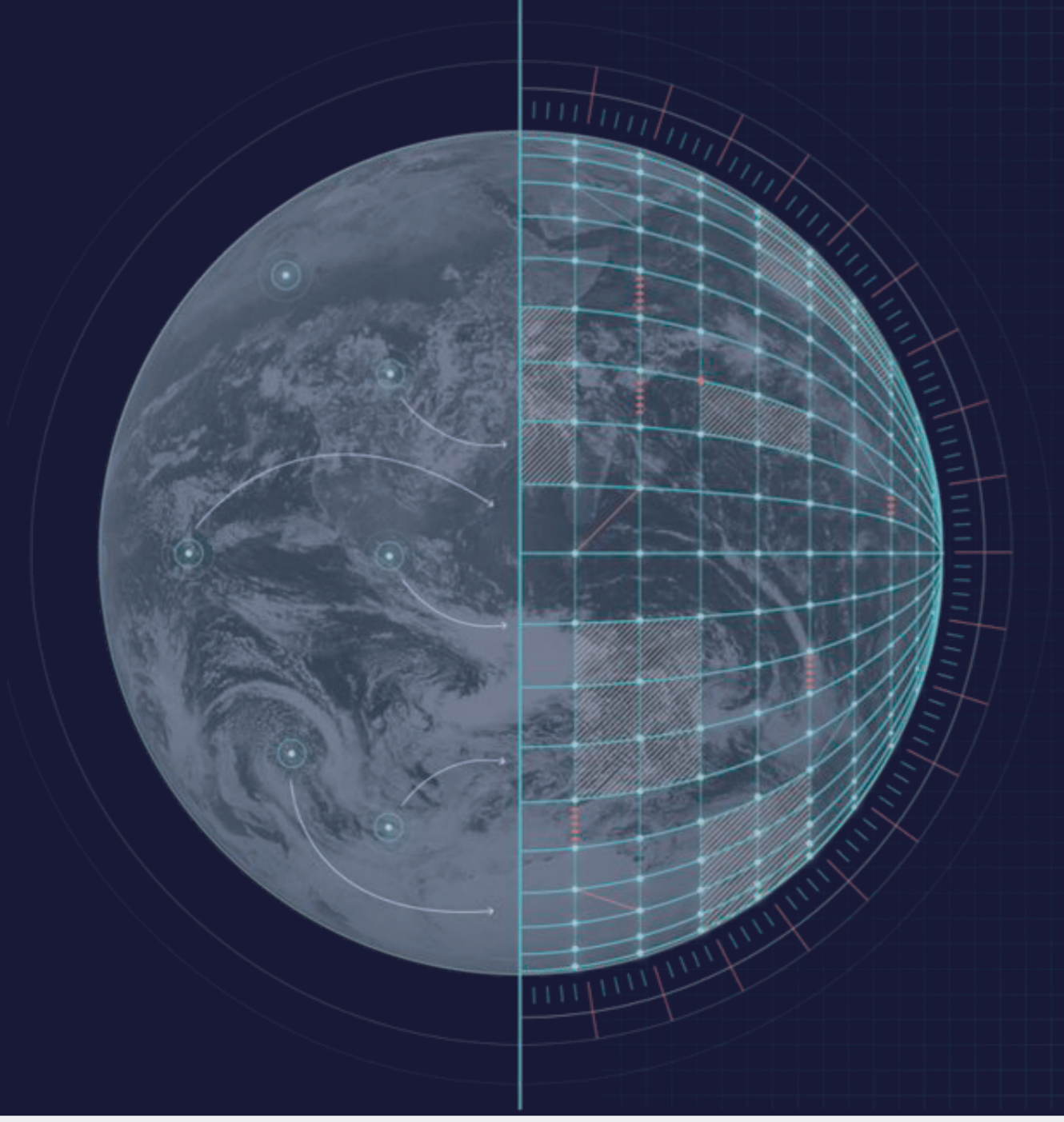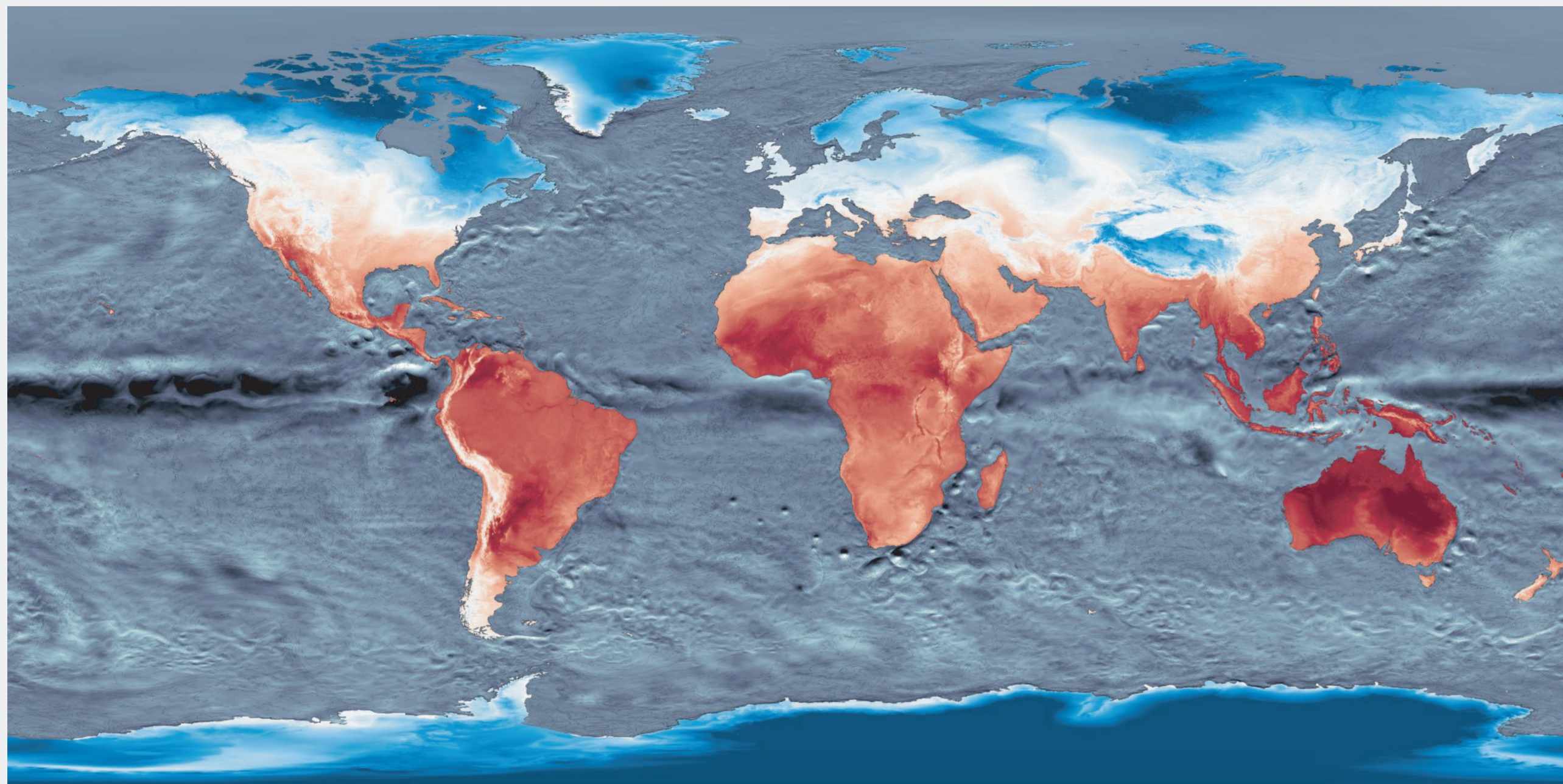# Climate DT Simulations
Status quo

Simulations

- ☑ **spinup:** 5-yr ocean+ 2-yr coupled
  Equilibrate from initial shocks
- ☑ **control-1990/2020:** 60/30 years
  Internal model variability Diagnose
  & correct remaining drifts
- ☑ **historical:** 30 years (1990-2019)
  Model validation vs observations
  Role of historical forcings
- ☑ **ssp370:** 30 years (2020-2049)
  Assess near-term future
- ☑ **Resolutions:** 10 kms (ocean)
  5-10 kms (atmos)

Models

ICON
- **horizontal resolution** of ~5 km in atmosphere and ocean
- **72 vertical** levels in the **atmosphere** and
- **128 levels** in the **ocean**

IFS-NEMO
- **Tco2559:** horizontal resolution ~4.4 km
- **Tco1279:** horizontal resolution ~7.8 km
- **137 vertical levels**
- **ORCA025:** Ocean resolution of ~25 km.
- **ORCA12:** Ocean resolution of ~9km

IFS-FESOM
- **Tco2559:** horizontal resolution ~4.4 km
- **Tco1279:** horizontal resolution ~7.8 km
- **137 vertical levels**
- **NG5:** unstructured Ocean grid, horizontal resolution ~5km

Available simulations

Storyline using nudging

Spectral nudging means constraining the dynamics of the model to align closely with observed values. It facilitates the simulation of various weather events across different climate contexts. This allows researchers to create comprehensive storylines associated with diverse extreme events, offering insights into the interactions between different climate conditions and the occurrence of such phenomena.

In simple terms, nudging enables us to observe recorded weather events in the context of a different climate, e.g. answer the question of how heatwaves such as in summer 2023 would enfold in a 2 degrees warmer climate.
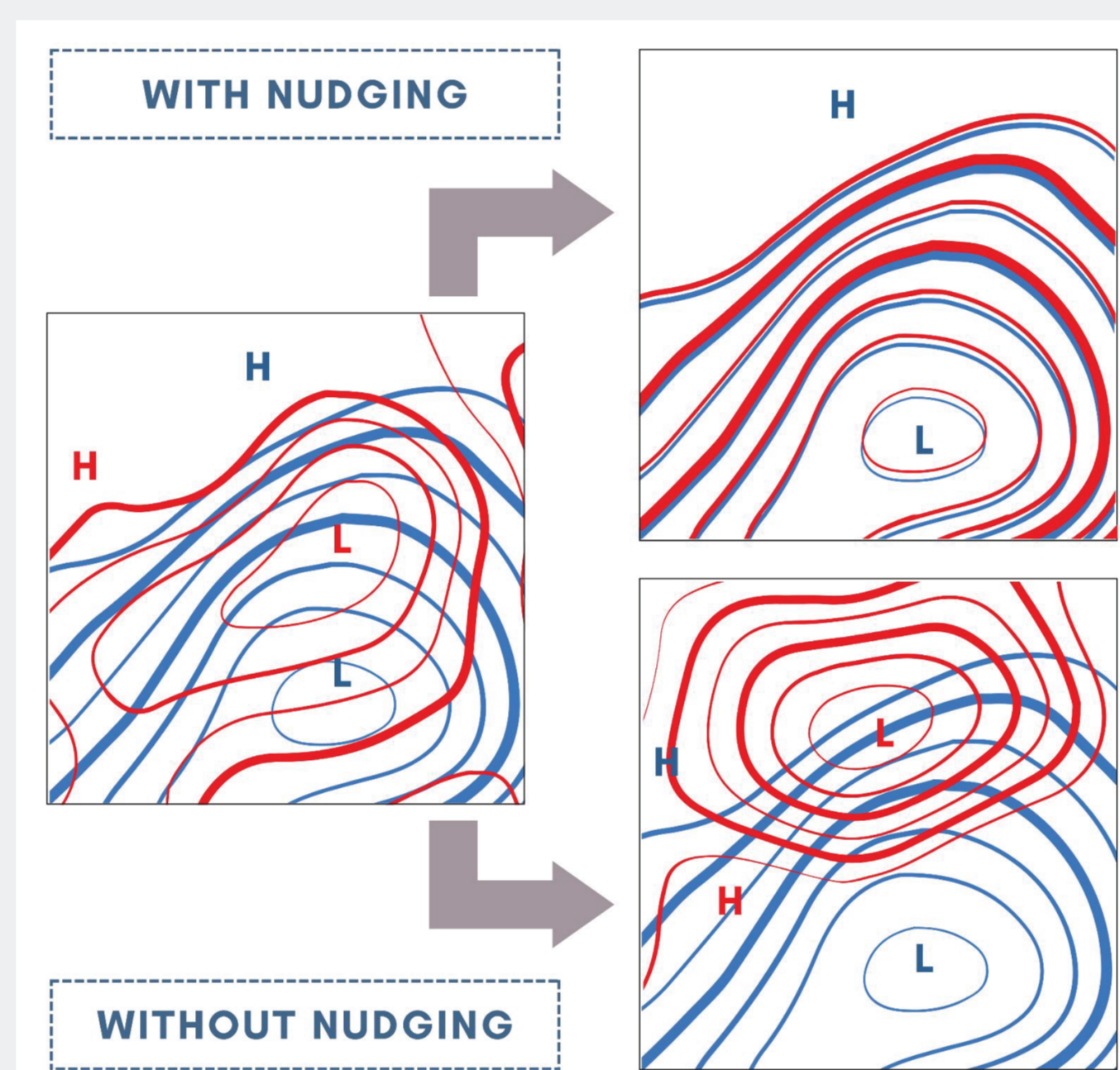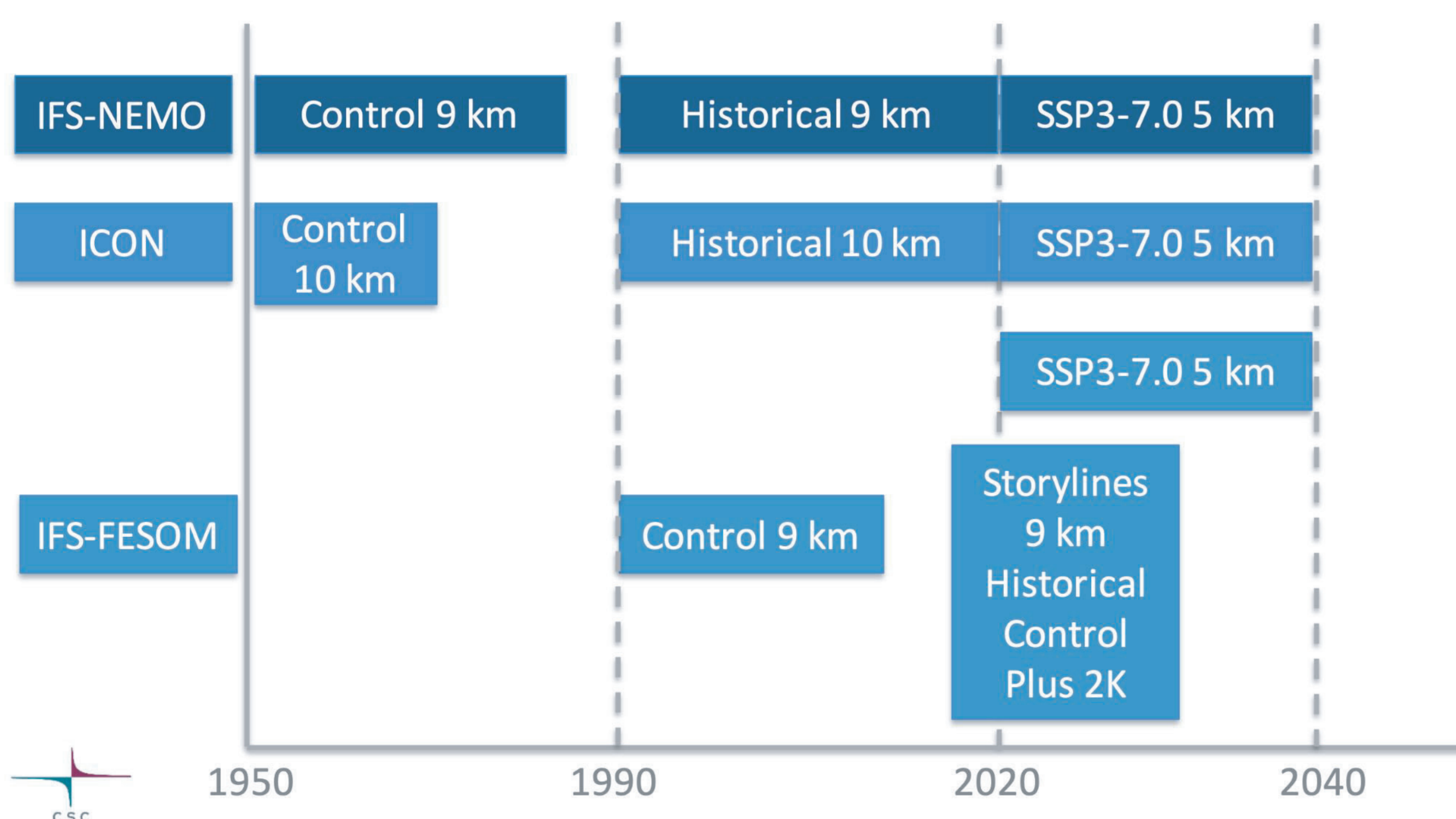

An illustration demonstrating the concept of spectral nudging. At a given time, both reference data (observations or reanalysis, shown in blue contours) and model data (red contours) are available. Spectral nudging constrains the model to align with the reference data, while allowing the model to evolve freely towards other stable states where it is not constrained. Concept credits to H. Goessling.
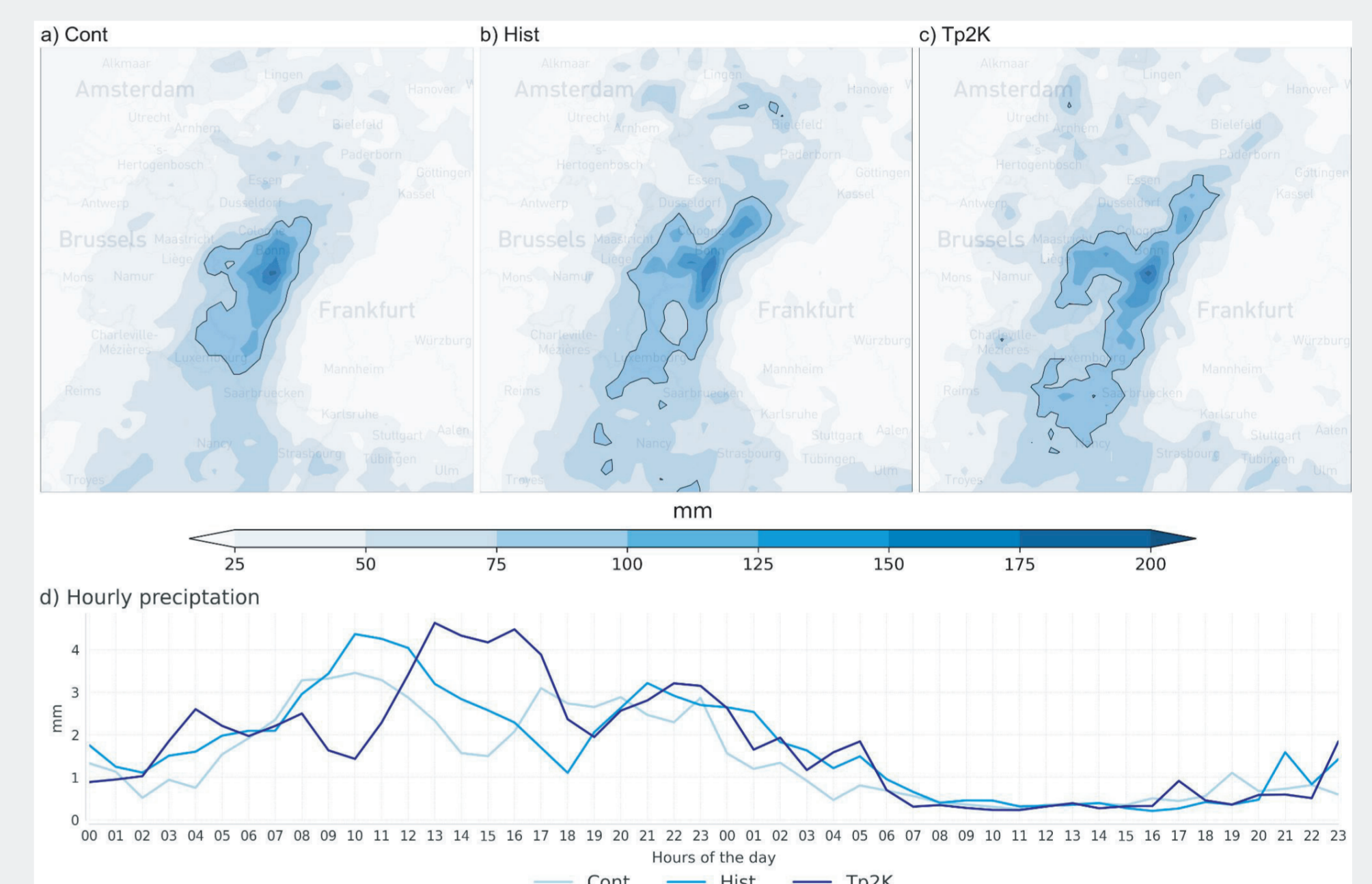
The top panel shows the 48-hour cumulative precipitation over the Ahr river basin in Germany from storyline experiments for July 14th to 15th 2021. The bottom chart shows the hourly precipitation time-series for the same event for the area inside the box of 50-51°N and 5.5-7°E. The figures compare how the torrential rain event (Hist) might have occurred in the past (Cont) versus its potential evolution in a future climate (Tp2K).

Current status