Mechanisms of **centennial AMOC variability** in a climate model of intermediate complexity

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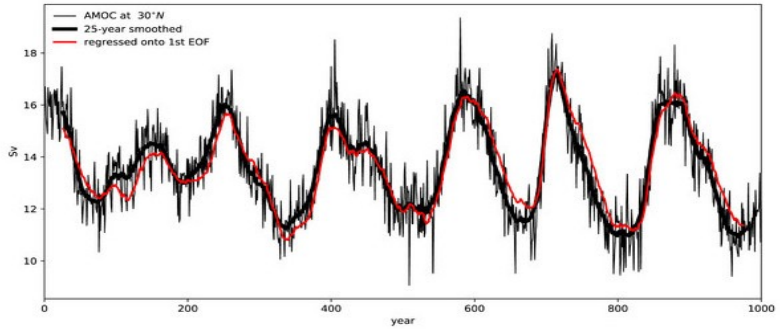
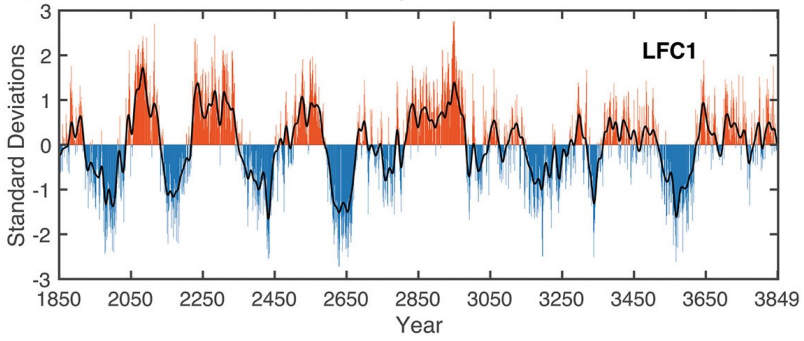
Multicentennial AMOC variability

…in CMIP6 models

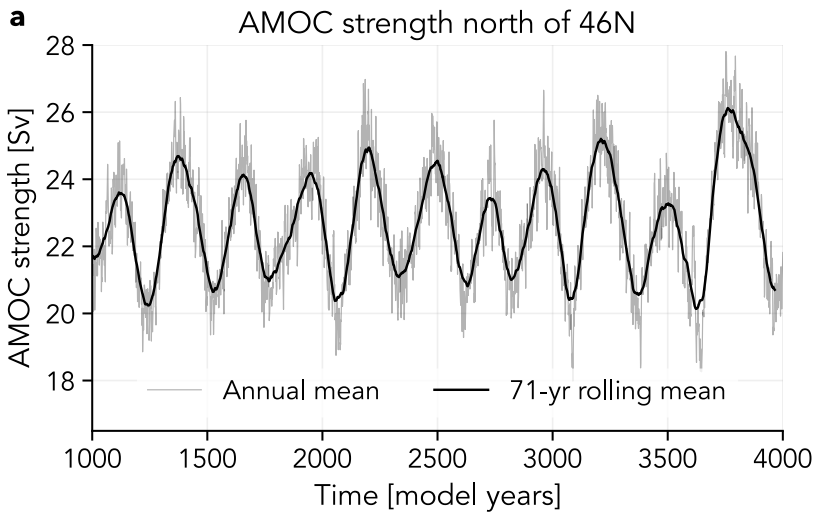
CNRM-CM6-1 (Waldman et al., *JPO*, 2021)



IPSL-CM6A-LR (Jiang et al., *JAMES*, 2021)

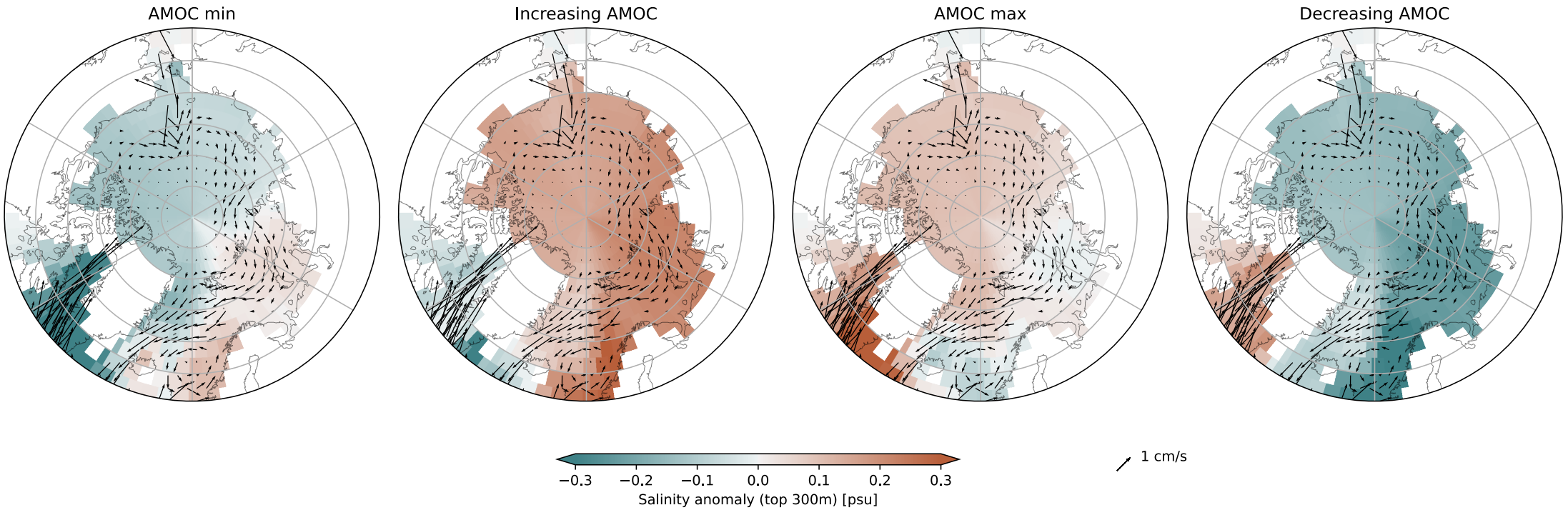


…in PlaSim–LSG (EMIC: low-resolution AOGCM with simplified physics)

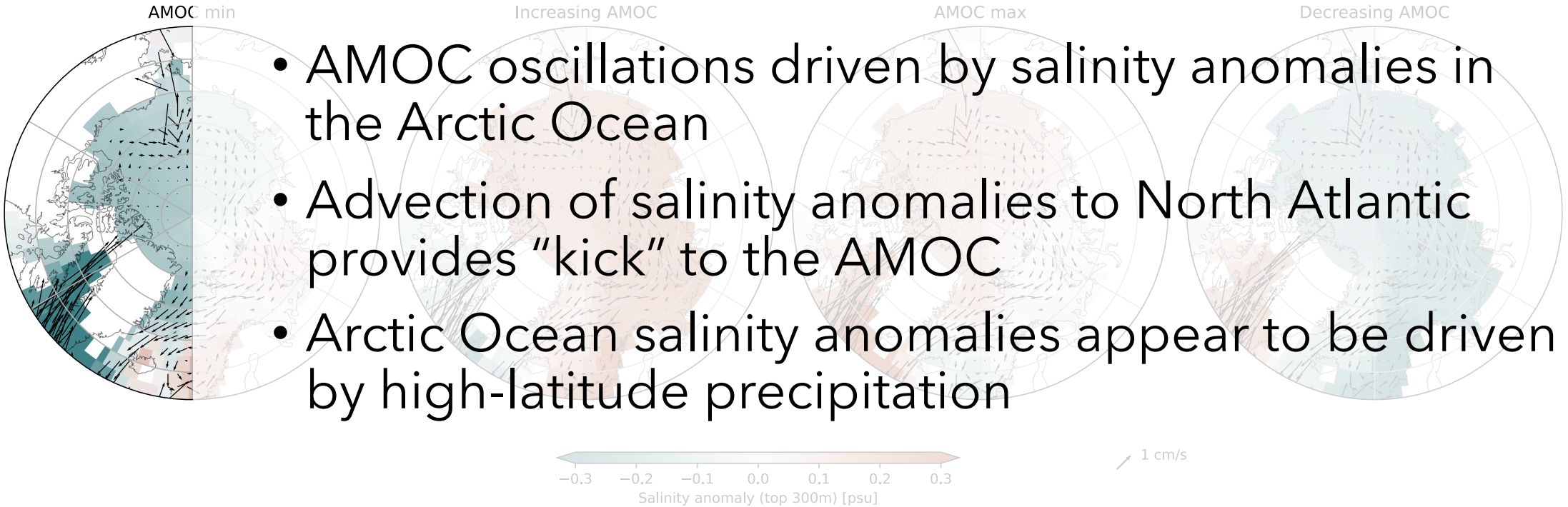


(c.f. Angeloni et al., *GMDD*, 2020)

Mechanism of AMOC oscillations in PlaSim–LSG



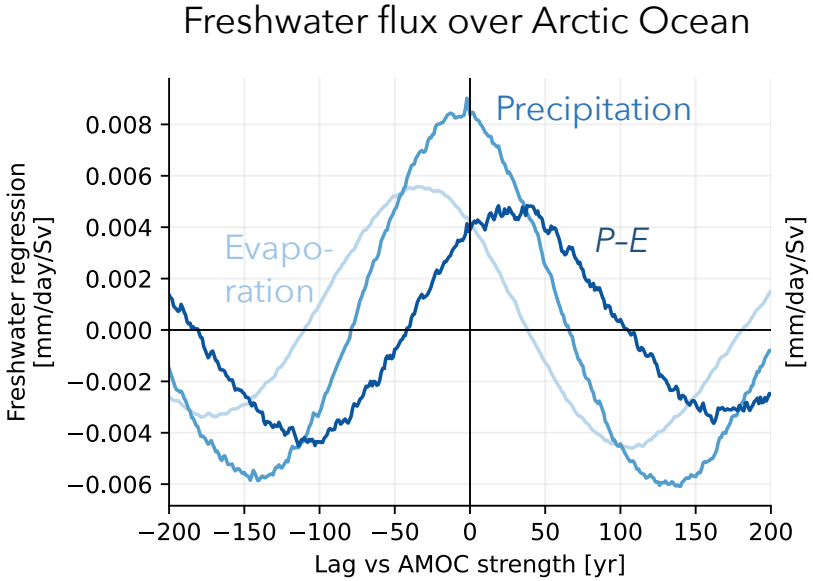
Mechanism of AMOC oscillations in PlaSim–LSG



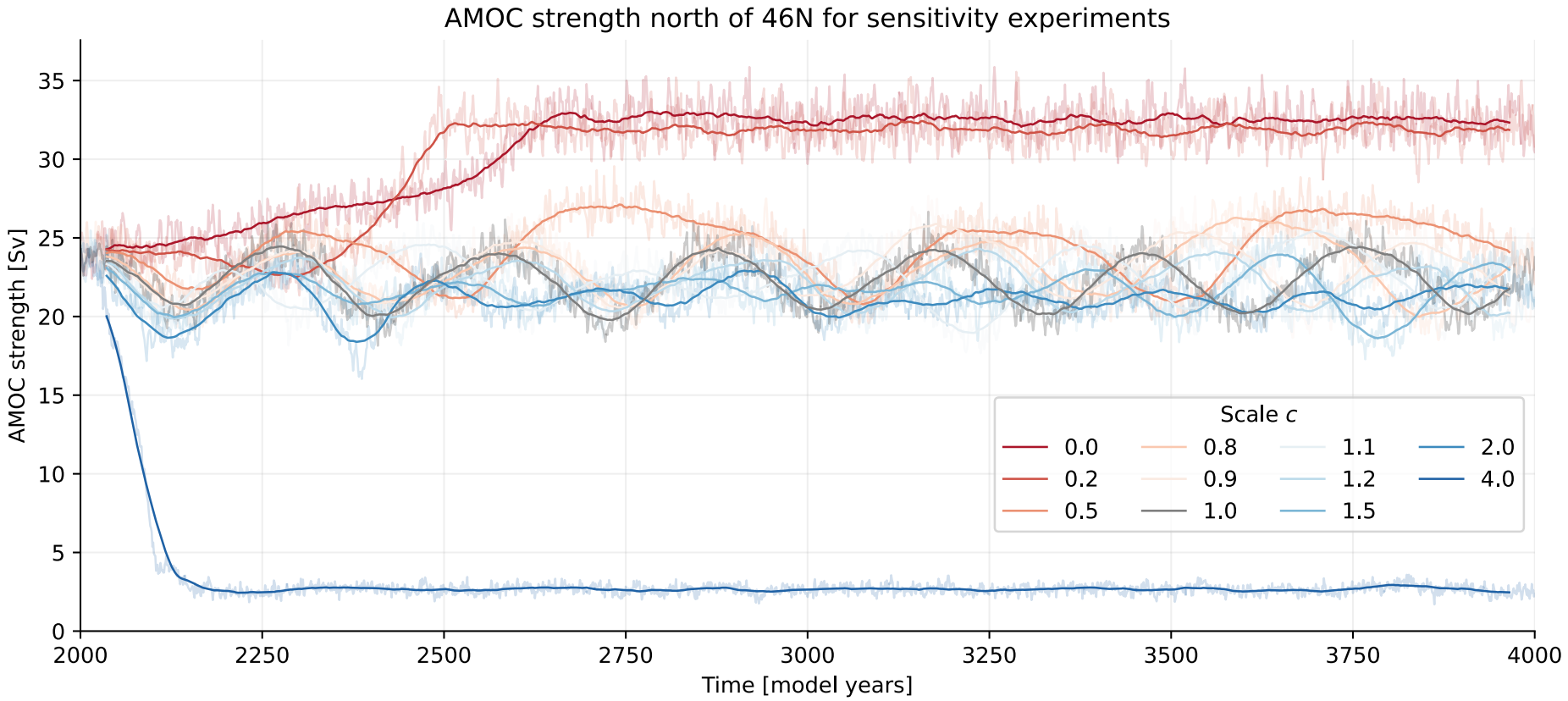
- AMOC oscillations driven by salinity anomalies in the Arctic Ocean
- Advection of salinity anomalies to North Atlantic provides “kick” to the AMOC
- Arctic Ocean salinity anomalies appear to be driven by high-latitude precipitation

Mechanism of AMOC oscillations in PlaSim–LSG

Precipitation anomalies are in phase with the AMOC due to AMOC-driven surface temperature changes across the northern hemisphere

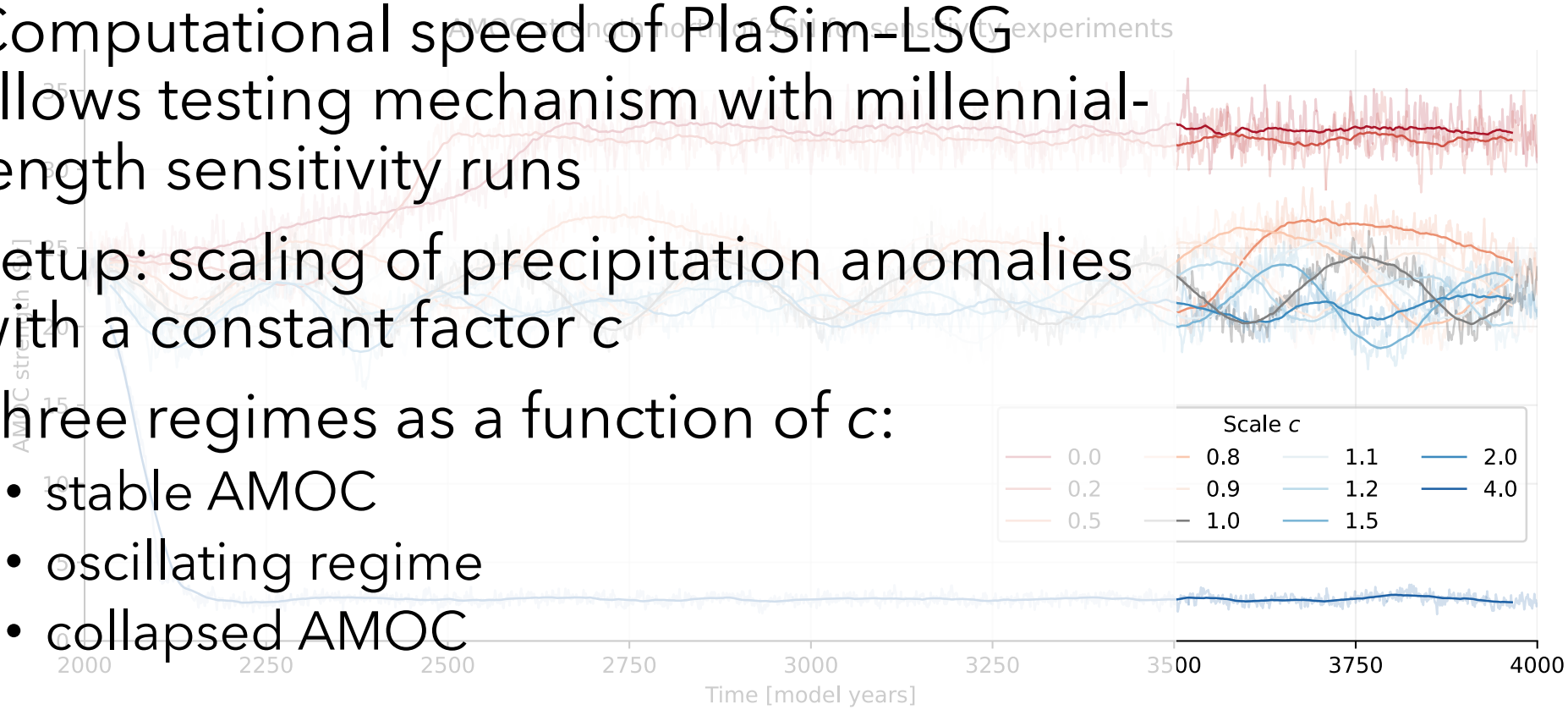


AMOC response to scaling Arctic *P–E*

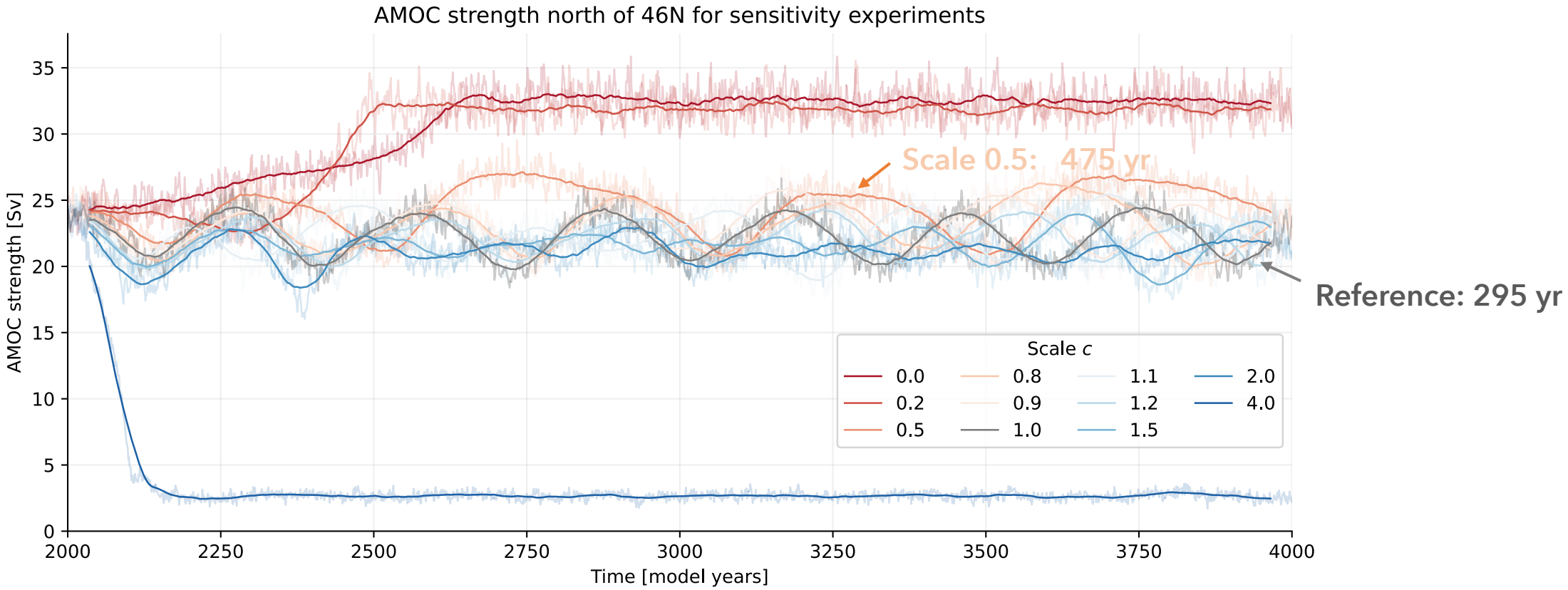


AMOC response to scaling Arctic *P–E*

- Computational speed of PlaSim–LSG allows testing mechanism with millennial-length sensitivity runs
- Setup: scaling of precipitation anomalies with a constant factor *c*
- Three regimes as a function of *c*:
  - stable AMOC
  - oscillating regime
  - collapsed AMOC

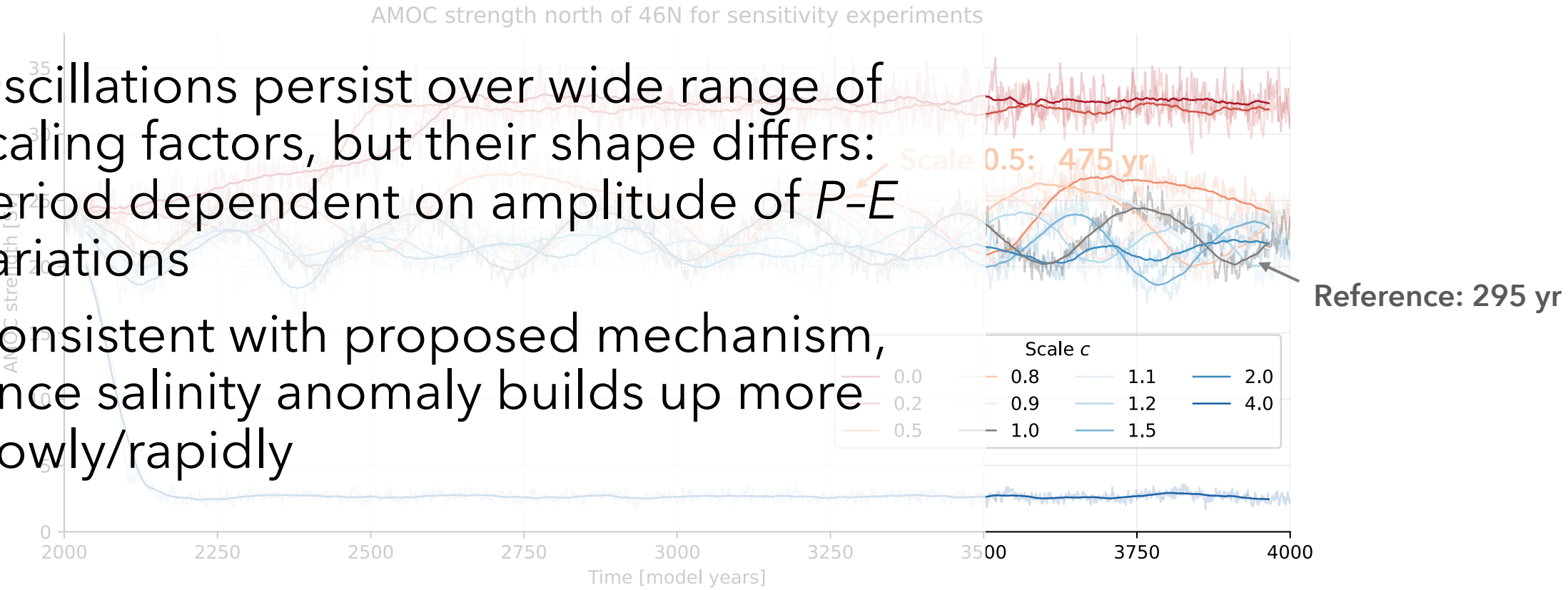


Period of AMOC oscillations

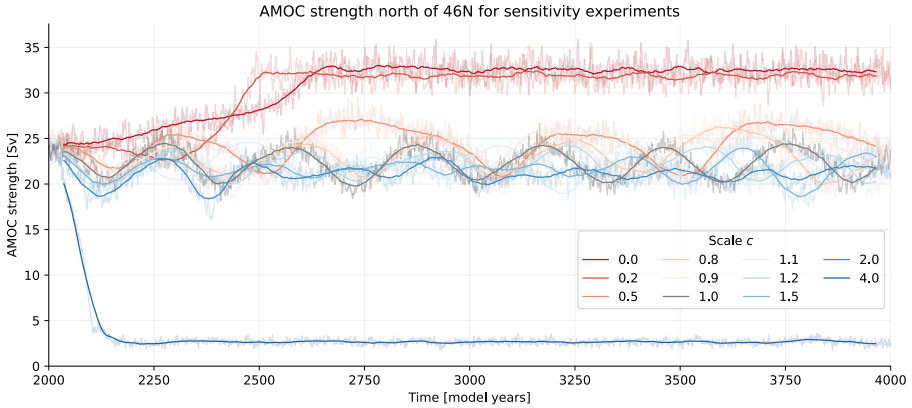


Period of AMOC oscillations

- Oscillations persist over wide range of scaling factors, but their shape differs: Period dependent on amplitude of *P–E* variations
- Consistent with proposed mechanism, since salinity anomaly builds up more slowly/rapidly



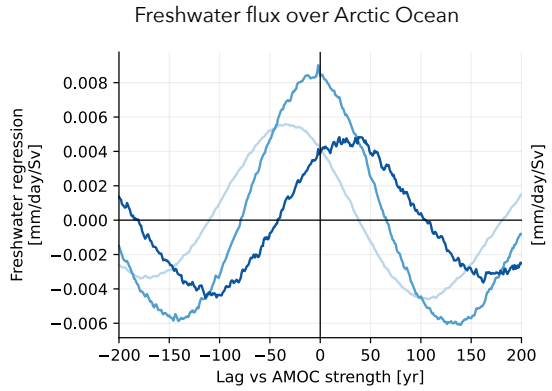
Conclusions/outlook



Similarities with multicentennial AMOC variability in some CMIP6 models

→ PlaSim–LSG as a testbed for sensitivity experiments

High-latitude precipitation:
Possible driver for AMOC variability in a warmer climate?



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