

Annual to multidecadal coherence of Atlantic meridional heat transport in last-millennium CMIP5 simulations and the Last Millennium Reanalysis

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Motivation

Ocean heat storage and transport has been implicated to explain climate and surface temperature variability on a range of time scales.

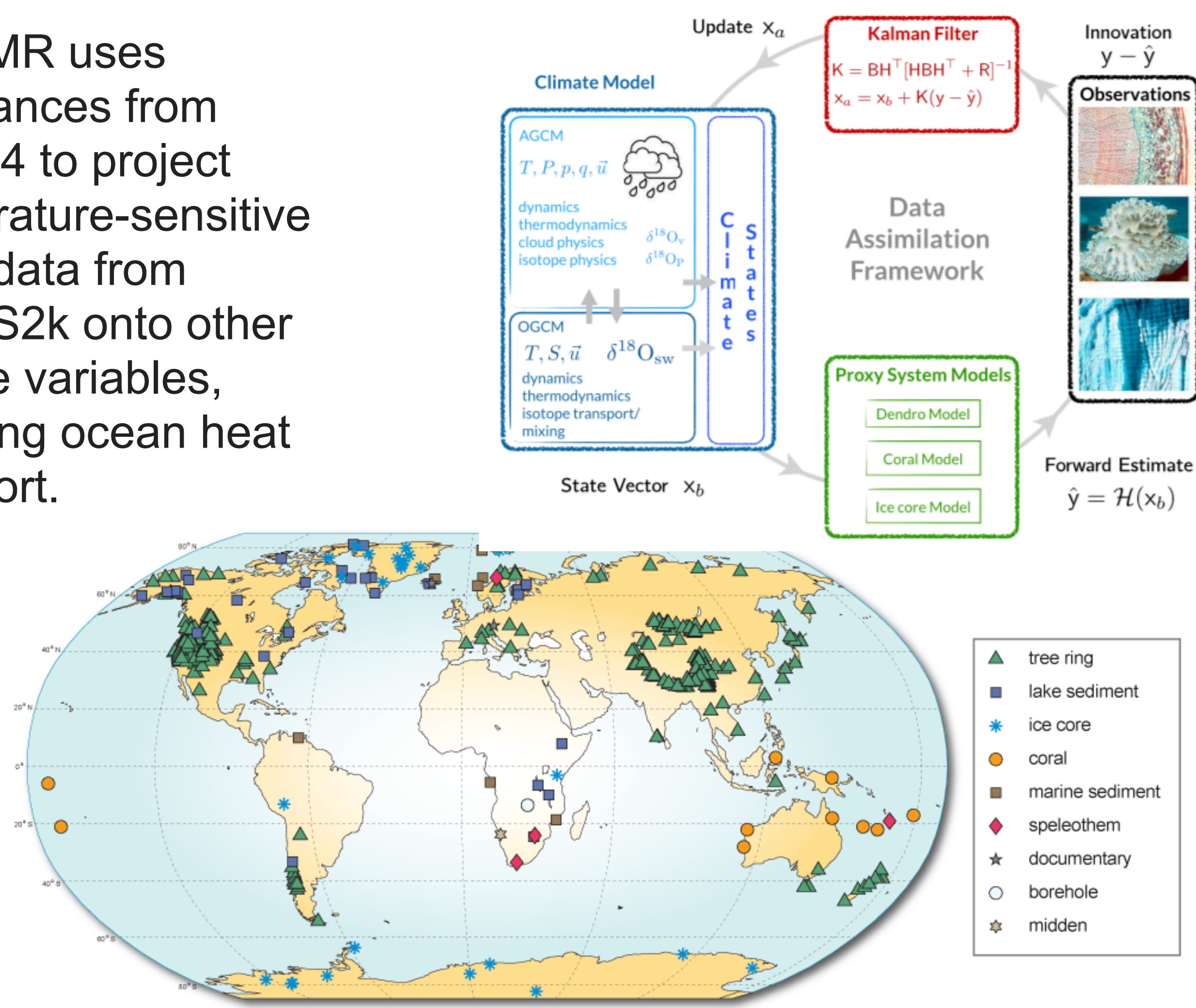
Zhang (2010) argues that different time scales point to different dynamical regimes for propagation of AMOC anomalies.

Is this behavior also evident in Atlantic meridional heat transport (AMHT)?

Can we use temperature-sensitive proxies spanning the last millennium to constrain AMHT on longer time scales and tell us about its role in past climate variability?

The Last Millennium Reanalysis Project

The LMR uses covariances from CCSM4 to project temperature-sensitive proxy data from PAGES2k onto other climate variables, including ocean heat transport.



Discussion points

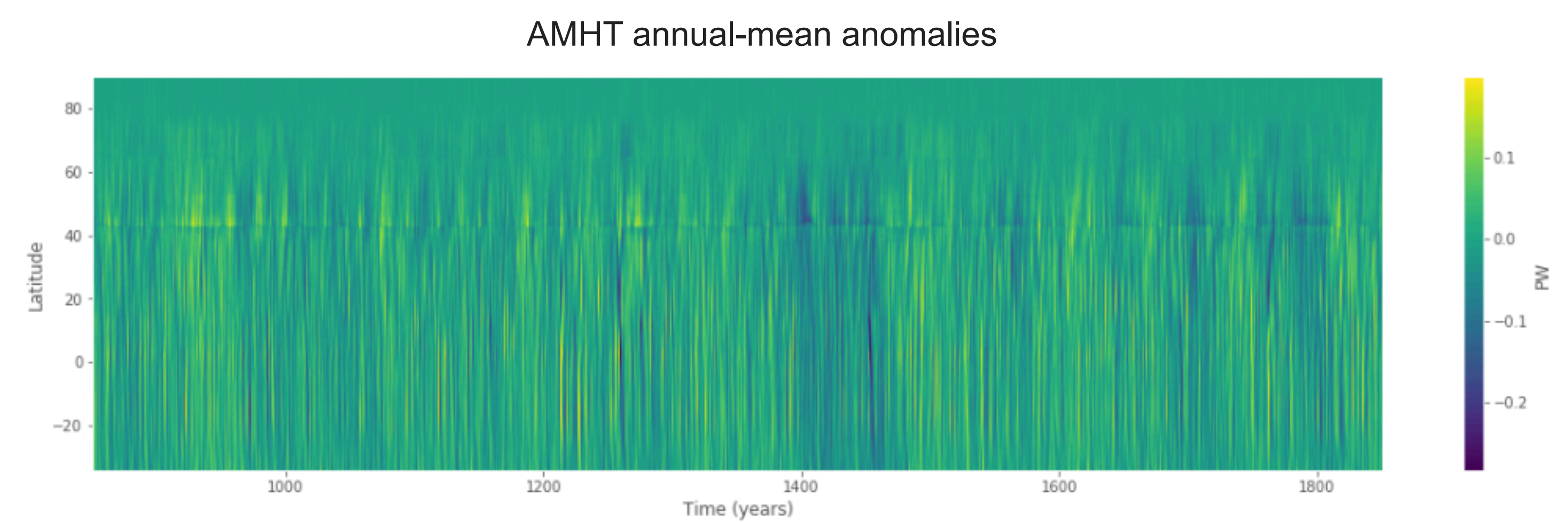
There is evidence for propagating signals in AMHT, particularly in the North Atlantic, qualitatively similar to AMOC in Zhang (2010).

Reconstructed changes in AMHT are mostly local and have smaller amplitude relative to CCSM4.

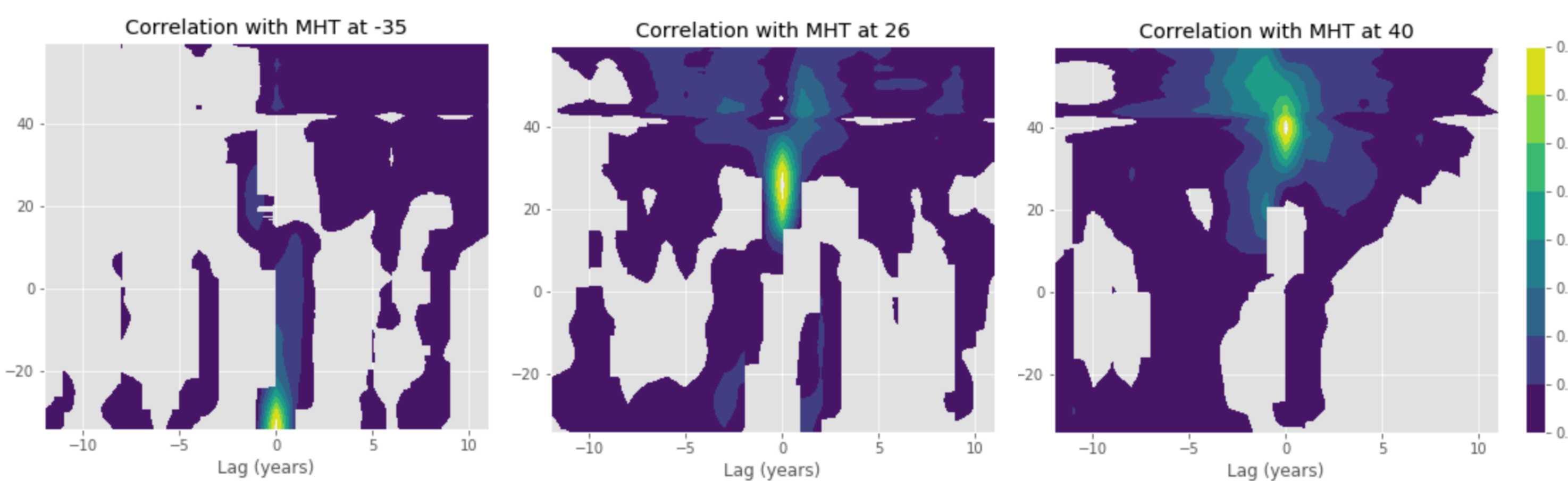
Data assimilation provides an avenue to understand what surface temperature proxies tell us about the ocean. Future work will evaluate what proxy coverage is necessary to reconstruct AMHT.

Distinguishing between local and basin-wide adjustments to AMHT is a challenge.

AMHT coherence in a CCSM4 Last Millennium simulation

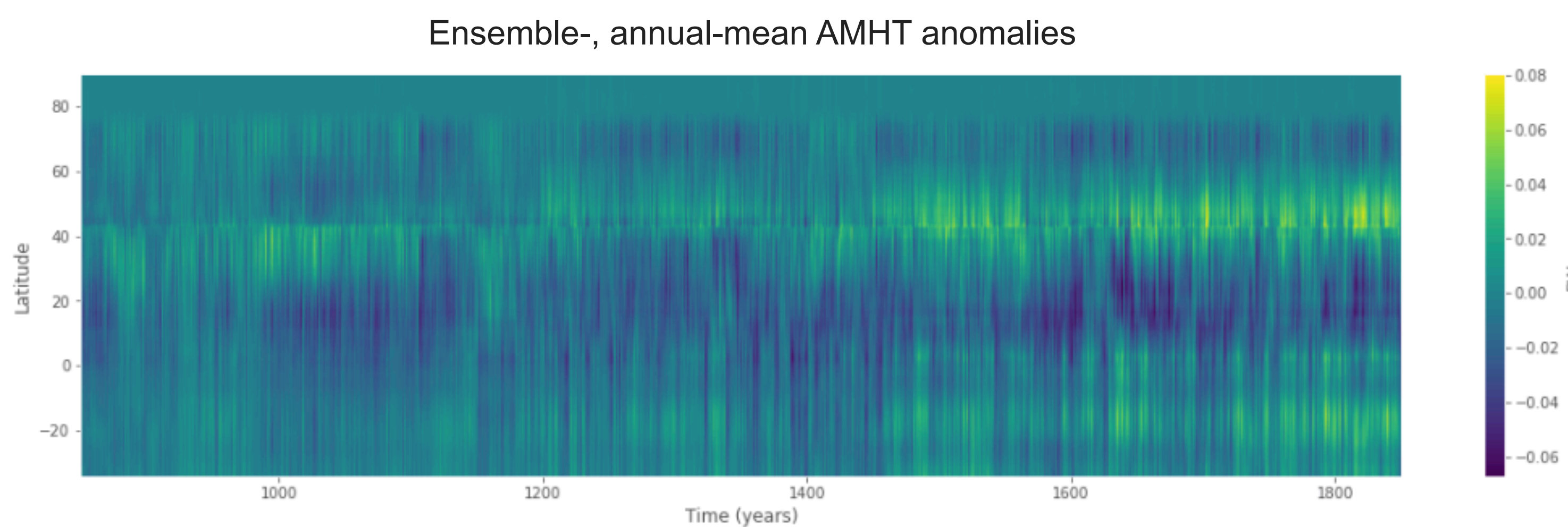


CCSM4 AMHT shows variability on many timescales.

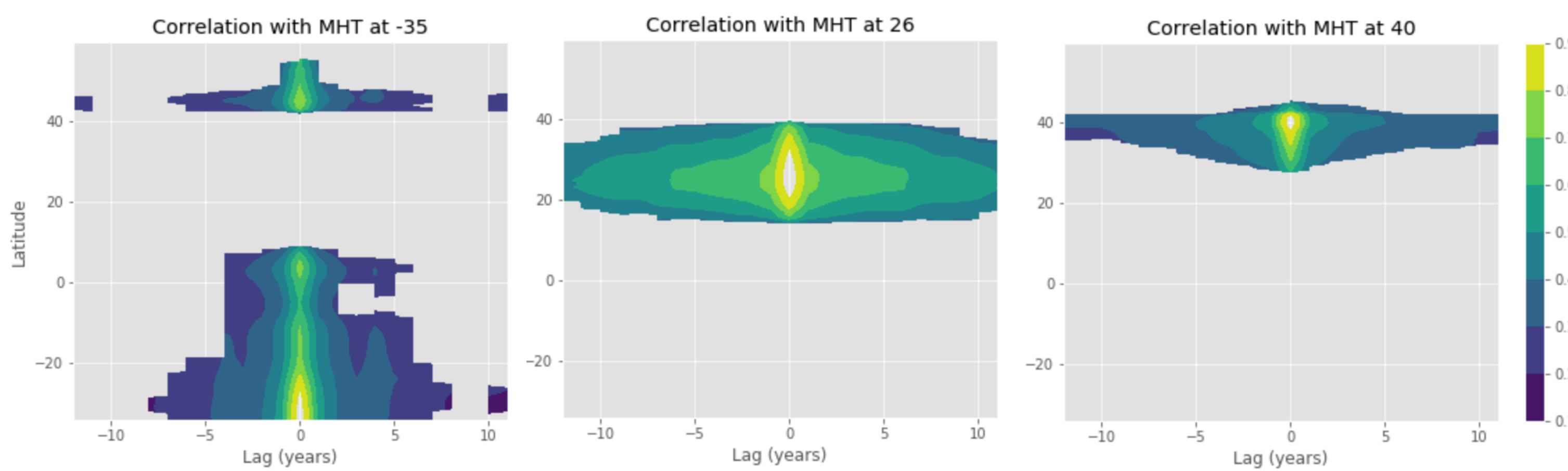


Correlations ($p < 0.01$) suggest propagating MHT changes in the model North Atlantic. Zero lag correlations may be due to wind forcing or signals propagating faster than 1 year.

AMHT coherence in the Last Millennium Reanalysis



Ensemble mean AMHT variations are smaller than simulated values. Perhaps AMHT variability simulated in CCSM4 is too large; alternately, the data may not adequately constrain AMHT.



Correlations in reconstructed values are nearly symmetric in time. Propagating features are absent. Paleoclimate data project mostly onto local heat transport adjustments.