Examining the relationships between low-frequency SST and AMOC variability

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An often cited motivation for studying variability of the Atlantic Meridional Overturning Circulation (AMOC) is the supposition that changes in the AMOC may lead to low-frequency (inter-annual to decadal), basin-scale sea surface temperature (SST) variability. However, despite numerous studies which show (lagged) correlations between AMOC and SST anomalies, the hypothesis that AMOC variability and the accompanying changes in meridional ocean heat transport are responsible for low-frequency SST changes has not been proven.

In this presentation I will use the Estimating the Circulation and Climate of the Ocean (ECCO) state estimate, which is produced by fitting an ocean general circulation model to global ocean observations, to examine the relative roles of atmospheric forcing and ocean dynamics in creating low-frequency SST/upper-ocean heat content (UOHC) anomalies. In particular, I will discuss the portion of the observed UOHC variability that can be explained by local atmospheric (wind and buoyancy) forcing and atmospheric forcing integrated along Rossby wave characteristics. By isolating the effects of these well-understood processes, I will determine in which regions and on what spatial scales and timescales large-scale changes in the ocean circulation, such as AMOC variability, play a significant role in creating UOHC anomalies.