The Role of AMOC in Atlantic Decadal Predictability

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Atlantic Decadal predictability has a wide range of societal and economic applications. Understanding its underlying physical mechanisms is crucial for successful future predictions. This presentation will discuss recent findings on the role of Atlantic meridional overturning circulation (AMOC) in Atlantic decadal predictability. One key mechanism for enhanced decadal predictability of the subpolar North Atlantic upper ocean heat content is the slow southward propagation of AMOC anomalies from northern high latitudes to the subtropics and associated anomalous Atlantic meridional heat transport convergence. Atlantic decadal predictability is much higher in fully coupled models with relatively stronger multidecadal AMOC variability than in fully coupled models with relatively weaker multidecadal AMOC variability, and almost disappears in models coupled with a slab ocean (i.e. slab ocean models) with no AMOC variability. The observed decadal persistence of the subpolar North Atlantic sea surface temperature (SST) anomalies associated with Atlantic Multidecadal Variability (AMV) will lead to much higher Atlantic decadal predictability than that obtained from the slab ocean models or the red noise process. Multidecadal AMOC variability is a major source of enhanced low-frequency variability and thus decadal persistence in the subpolar North Atlantic SST anomalies associated with the AMV. Multidecadal AMOC variability also has predictive impacts on Atlantic major hurricane frequency and Arctic sea ice extent. It is crucial to improve the amplitude of multidecadal AMOC variability in fully coupled models to achieve much higher Atlantic decadal predictability.

