

Is AMOC more predictable than North Atlantic heat content?  
Grant Branstator and Haiyan Teng, NCAR

It is commonly hypothesized that the impact of initializing climate predictions will have a detectable, and potentially beneficial, influence at longer prediction ranges for AMOC than for other state components. We test this hypothesis by comparing the predictability properties of AMOC with another component often featured in studies of decadal prediction, namely the heat content of the North Atlantic. We do this by finding the initial value predictability of these two fields in nine CMIP5 models using analog and regression techniques that estimate predictability from the statistics of long control runs and that enable many initial states to be considered.

Our results indicate that the potential impact of initializing decadal time scale predictions varies substantially from one model to another, but for almost every model initial value predictability of annual means is lower for AMOC than for North Atlantic heat content. AMOC and heat content predictability become similar if predictions of 5 year averages are considered, but only for 10 year and longer averages is AMOC substantially more predictable. One of our very optimistic findings is that there are certain patterns of AMOC that are predictable two or three times longer than generic variability. For these patterns AMOC is more persistent and is coupled to heat content. Lastly, we find AMOC gains less predictability from the effect of external forcing than does heat content. Indeed, on decadal time scales, information added to predictions by inclusion of their response to RCP scenarios is much less for AMOC than for heat content.