Atlantic meridional overturning circulation variability in forced COREII versus coupled CMIP5 simulations

Xiaobiao Xu[1], Eric Chassignet*[1], and Fuchang Wang[1]

[1]COAPS/FSU – United States

Abstract

The Atlantic meridional overturning circulation (AMOC) plays a fundamental role in the earth climate system. However, the characteristics of the AMOC variability in coupled climate simulations is not very well understood. In this presentation, we compare the interannual, decadal, and multidecadal variability of the AMOC in two model configurations: Phase 2 of the Coordinated Ocean-ice Reference Experiment (COREII) in which a common atmospheric state is prescribed and Phase 5 of the Coupled Model Inter-comparison Project (CMIP5) in which the atmospheric state is fully coupled. We show that all the forced COREII simulations display similar AMOC variability, whereas the coupled CMIP5 models do not. The magnitude of multi-decadal variability in the COREII simulations is more than twice that of the CMIP5 simulations and the variability exhibits a higher degree of meridional coherence. However, on interannual and decadal time scales, the AMOC variability and meridional coherence are similar. The results seem to indicate that on interannual to decadal scales, the modeled AMOC variability is intrinsic and insensitive to atmospheric state, whereas on long-term multi-decadal scale, the modeled AMOC variability is external, and is sensitive as to whether the atmosphere is coupled to ocean dynamics.

*Speaker