

Comparison of Decadal AMOC Variability Among Climate Models

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Atmosphere-ocean general circulation models (AOGCM's) often exhibit decadal variability of the Atlantic Meridional Overturning Circulation (AMOC), but the nature of this variability shows great quantitative and qualitative differences among different experiments. Here, the same metrics are used to compare AMOC variability among several AOGCM's in preindustrial control runs for the Climate Model Intercomparison Project (CMIP). All the models show spectral peaks in meridional overturning at periods of less than a century. We examine the 3-61 year band to isolate this frequency range. The meridional stream function shows a maximum in the North Atlantic ranging from about .5 to 1.8 Sv (about 3% to 10% of the time-mean overturning strength), with period (based on the lagged autocorrelation) ranging from about 10 to 25 years for most of the models (50 years for one model). In all models, overturning variability is strongest between 40N and 60N, with a weaker overturning signal propagating across the equator within a few years. The streamfunction anomalies show vertical structure typical of deep thermohaline flow except for one model which shows evidence of Ekman transport as well. Most of the models show a somewhat complex high-latitude density field associated with the meridional overturning, making it unclear whether the overturning oscillation in different models is caused by density oscillation in the deep water formation region.