

Two decades of the AMOC: its structure, variability, and predictability

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The zonally integrated meridional volume transport in the Atlantic is described in a 19-year long global ocean state estimate. The estimate is a dynamically and kinematically consistent fit to diverse global data sets. Time series at various latitudes exhibit substantial daily, monthly, and inter-annual variability, and are indistinguishable from a stationary Gaussian stochastic process. Weak trends are apparent toward high latitudes, but cannot be separated from intrinsic multi-decadal baroclinic adjustment time scales due to the shortness of the record. Statistical analyses, including coherence spectra between different latitudes do not provide any simple characterization. They suggest instead the necessity of analyzing the three-dimensional structure of the circulation, which may highlight the importance of processes masked by the zonal sums. Different approaches of linear predictability indicate prediction horizons well below a decade. The remaining limitations in process understanding and predictive skill call for substantially increased observational capabilities.