EGU General Assembly 2020

EGU2020-5894, updated on 20 Aug 2022
https://doi.org/10.5194/egusphere-egu2020-5894
EGU General Assembly 2020


# Contrasting sources of variability in subtropical and subpolar Atlantic overturning

**Yavor Kostov**[1], Helen L. Johnson[2], David P. Marshall[3], Gael Forget[4], Patrick Heimbach[5], N. Penny Holliday[6], Feili Li[7], M. Susan Lozier[7], Helen R. Pillar[5], and Timothy Smith[5]

[1]University of Exeter, Geography, Exeter, United Kingdom of Great Britain and Northern Ireland (y.kostov@exeter.ac.uk)
[2]University of Oxford, Earth Sciences, Oxford, United Kingdom of Great Britain and Northern Ireland
[3]University of Oxford, Physics, Oxford, United Kingdom of Great Britain and Northern Ireland
[4]Massachusetts Institute of Technology, Earth, Atmospheric, and Planetary Sciences, Cambridge, Massachusetts, United States of America
[5]University of Texas at Austin, Oden Institute, Austin, Texas, United States of America
[6]National Oceanography Centre, Southampton, United Kingdom of Great Britain and Northern Ireland
[7]Georgia Institute of Technology, Earth and Atmospheric Sciences, Atlanta, Georgia, United States of America

**The Atlantic meridional overturning circulation (AMOC) is pivotal for regional and global climate due to its key role in the uptake and redistribution of heat, carbon and other tracers. Establishing the causes of historical variability in the AMOC can tell us how the circulation responds to natural and anthropogenic changes at the ocean surface. However, attributing observed AMOC variability and inferring causal relationships is challenging because the circulation is influenced by multiple factors which co-vary and whose overlapping impacts can persist for years. Here we reconstruct and unambiguously attribute variability in the AMOC at the latitudes of two observational arrays to the recent history of surface wind stress, temperature and salinity. We use a state-of-the-art technique that computes space- and time-varying sensitivity patterns of the AMOC strength with respect to multiple surface properties from a numerical ocean circulation model constrained by observations. While on inter-annual timescales, AMOC variability at 26°N is overwhelmingly dominated by a linear response to local wind stress, in contrast, AMOC variability at subpolar latitudes is generated by both wind stress and surface temperature and salinity anomalies. Our analysis allows us to obtain the first-ever reconstruction of subpolar AMOC from forcing anomalies at the ocean surface.**