



2025-2026 EOAS Colloquium Series

Interannual variability of the subpolar AMOC

Variability of the Atlantic Meridional Overturning Circulation (AMOC) has drawn extensive attention due to its impact on the global redistribution of heat and freshwater. Here we present the latest time series (2014-2022) of the Overturning in the Subpolar North Atlantic Program (OSNAP) and characterize AMOC interannual variability through a volume budget analysis for the subpolar basins' lower limbs. We find that surface water mass transformation is linked to lower limb volume variability, which translates to AMOC changes within the same year.

The subpolar North Atlantic has also undergone unprecedented freshening in the past decade. The OSNAP observations provide a unique opportunity to examine how freshwater forcing influences AMOC variability. Preliminary results show that as the freshwater anomaly moved through first the eastern and then the western subpolar gyre, it generated a transient AMOC signal on interannual timescales: overturning weakened in the eastern subpolar gyre but strengthened in the western gyre a few months later. In both gyres, the overturning changes were linked to salinity-induced density anomalies, which produced cross-basin geostrophic velocity anomalies. Our findings highlight the role of freshwater forcing in subpolar AMOC variability on interannual timescales and suggest a compensating mechanism between eastern and western subpolar overturning.



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