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Dynamical Attribution of Recent Variability in Atlantic Overturning

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Attributing observed variability of the Atlantic Meridional Overturning Circulation (AMOC) to past changes in surface forcing is challenging but essential for detecting any influence of anthropogenic forcing and reducing uncertainty in future climate predictions. Here we obtain quantitative estimates of wind and buoyancy-driven AMOC variations at 25N by projecting observed atmospheric anomalies onto model-based dynamical patterns of AMOC sensitivity to surface wind, thermal and freshwater forcing over the preceding 15 years. We show that local wind forcing dominates AMOC variability on short timescales, whereas subpolar heat fluxes dominate on decadal timescales. The reconstructed transport time series successfully reproduces most of the interannual variability observed by the RAPID-MOCHA array. However, the apparent decadal trend in the RAPID-MOCHA time series is not captured, requiring improved model representation of ocean adjustment to subpolar heat fluxes over at least the past two decades, and highlighting the importance of sustained monitoring of the high latitude North Atlantic.