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Observed Evidence of a Stable Atlantic Meridional Overturning Circulation since the 1990s

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The Atlantic Meridional Overturning Circulation (AMOC) is crucially important in the global climate system due to its role in the meridional heat and freshwater distribution. Model simulations and constructed AMOC indices suggest that the AMOC may have been weakening for decades. However, direct AMOC observations, introduced in 2004 in the subtropics (the RAPID program) and in 2014 in the subpolar North Atlantic (the OSNAP program), are not sufficiently long to capture changes dating back to previous periods. Here we use repeated hydrographic sections in the subtropical and subpolar North Atlantic through the early 1990s to the mid-2010s, combined with a box inverse model that is constrained using satellite altimetry, to analyze hydrographic changes and the AMOC. In combination with a state-of-the-art ocean state estimate, GECCO2, we show that despite dramatic hydrographic changes in the subtropical and subpolar North Atlantic over the past two and half decades, the AMOC has not significantly weakened over the same period. Our hydrography-based estimates also illustrate a remarkably stable partition of the subpolar overturning between the Labrador basin and the eastern subpolar basins on decadal timescales since the 1990s.