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A direct estimate of poleward volume, heat and fresh water flux at 59.5°N between Greenland and Scotland

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The meridional overturning circulation (MOC) in the North Atlantic plays a major role in the transport of heat from low latitudes to high. In this study we combine recent measurements of currents from the surface to >700 m from a shipboard acoustic Doppler current profiler on the Nuka Arctica, a freighter in regular service between Greenland and Denmark with Argo profiles (to 2000 m) to estimate poleward volume, heat and freshwater flux at 59.5°N between Greenland and Scotland. For the period late 2012 to early 2016 the de-seasoned mean meridional overturning circulation reaches a 14.9±1.7 Sv maximum at the $\sigma\theta$ = 27.55 kg m-3 isopycnal, which varies in depth from near the surface in the western Irminger Sea to 1000 m in Rockall Trough. The surface to bottom transport has a -0.44 Sv (southward) residual, which is not significantly different from zero. The total heat and fresh water fluxes across 59.5°N = 307 PW and 0.15 Sv, both with a 12% uncertainty principally due to uncertainties of the MOC.

Comparing this ADCP dataset with an earlier one of comparable size from 1999-2002 (to 400 m depth only) shows strikingly similar transports in both west and east of the Reykjanes Ridge suggesting at least for these two periods 13 years apart very little difference in the strength of the MOC.