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Meridional coherence of the MOC in the subtropical North Atlantic

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The Atlantic Meridional Overturning Circulation (AMOC) extends from the South Atlantic to the high latitudes North Atlantic, transporting heat northwards in the upper 1000 m and storing carbon and other properties at depth. The AMOC has previously been referred to as the 'great ocean conveyor', with this nomenclature leading one to expect that when the AMOC speeds up at one latitude, it speeds up simultaneously and by the same amount at all other latitudes or, in other words, that the AMOC is meridionally coherent. Based on the expectation that changes to the AMOC both herald and drive climate shifts, intensive observational arrays have been put in place (from south to north: SAMBA 34.5S, 11S, 16N, 26N, 47N, OSNAP) with additional efforts using satellite data and Argo to estimate ocean transport variability. Observations of the large-scale circulation seem to contradict the expectation of meridional coherence. Here, we will synthesise the findings of meridional coherence of the AMOC on daily to interannual timescales using the long in situ observations between 16N and 41N. These are that the AMOC transports are out-of-phase on subannual timescales, linked to wind-forced variability and (2) coherent with a time-lag on interannual timescales. Using both in situ and satellite approaches, the phased and coherent variability will be traced back to wind- and buoyancy-forcing on ocean transport variability.