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Sub-seasonal to seasonal variability of the Atlantic Meridional Overturning Circulation at 26.5N

T.O. Kanzow (2), S.A. Cunningham (1), W. Johns (3), J. Hirschi (1), J. Marotzke (5), C. Meinen (4), L. Beal (3), C. Atkinson (1), M-P. Chidichimo (5), J. Collins (6), and the RAPID-MOC/MOCHA Team

(1) National Oceanography Centre, Ocean Observations and Climate, Southampton, United Kingdom (scu@noc.soton.ac.uk), (2) Leibniz Institut für Meereswissenschaften an der Universitaet Kiel, Ozeanzirkulation und Klimadynamik, Duesternbrooker Weg 20, 24105 Kiel, Germany, (3) University of Miami, Rosenstiel School of Marine and Atmospheric Sciences, 4600 Rickenbacker Causeway, Miami, FL 33149-1098, USA., (4) NOAA Atlantic Oceanographic and Meteorological Laboratory, Physical Oceanography Division, 4301 Rickenbacker Causeway, Miami, FL 33149, USA. British Oceanographic Data Centre, 6 Brownlow Street, Liverpool, L3 5DA, UK. , (5) Max Planck Institut für Meteorologie, Ocean in Erdsystem, Budesstraße 53, 20146 Hamburg, Germany, (6) British Oceanographic Data Centre, 6 Brownlow Street, Liverpool, L3 5DA, UK.

A 3.5-year timeseries of the strength of the Atlantic meridional overturning circulation (AMOC) at 26.5°N is derived from the addition of four transport components: 1. Gulf Stream transports in Florida Straits inferred from cable measurements; 2. Ekman transports from wind stress measurements; 3. current meter measurements of the shallow and deep western boundary currents and; 4. mid-ocean transports inferred from mooring-based density measurements east of the Bahamas, on both flanks of the mid-Atlantic Ridge and across the African continental slope. The mean AMOC strength is 18.5 Sv, and the standard deviation of 4.9 Sv reflects substantial sub-seasonal and seasonal variability. Fluctuations in Gulf Stream, Ekman and mid-ocean transports are uncorrelated and so their variability translates directly into AMOC variability.

The sub-seasonal variance (periods between 10 and 90 days) of the Ekman transport exceeds that of the Gulf Stream and the mid-ocean transport, dominating fluctuations of the AMOC. However, the seasonal variance (periods > 180 days) of both the Gulf Stream and the mid-ocean transport exceed that of the Ekman transport, dominating seasonal fluctuations of the AMOC. The amplitude of seasonal variations in the AMOC is $\pm$4.2 Sv with maxima in early Autumn and minima in early Spring. The seasonal cycle in upper mid-ocean transport is dominated by a strong seasonal cycle in eastern boundary densities from the surface to 1000 dbar, which is a consequence of seasonal variations of the eastern boundary wind stress curl.