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Simulated Decadal Variability of the Meridional Overturning Circulation across the A25-Ovide section

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Decadal changes of the Meridional Overturning Circulation (MOC) at the A25-Ovide section between Portugal and Greenland are investigated in a numerical simulation forced by atmospheric reanalysis data for the period 1965-2004. The intensity, composition and structure of the upper MOC limb are assessed using a Lagrangian analysis tool. Its mean transport is fed by water masses of two distinct origins: the subtropics and the Labrador Sea. Two vertical overturning cells are consequently identified: a subtropical cell connecting low and high latitudes (12 Sv, 1 Sv = 10ˆ6 mˆ3 sˆ-1) and a cell internal to the subpolar gyre (4 Sv). The decadal MOC variability is associated with synchronized transport changes of the subtropical and subpolar inflow within the North Atlantic Current (NAC). The varying strength of the MOC is further related to changes in the upper horizontal transport distribution. When the MOC is in a strong phase (early 1990's), the northern branch of the NAC in the Iceland Basin is strong while the southern branch at the Rockall Trough entrance is relatively weak. The inverse situation holds for a persistent weak MOC state (1970's). Contrary to the conclusions of earlier studies, variability in the strength and shape of the subpolar gyre does not stand as the main driver of the changing NAC structure, which is largely induced by the horizontal variability of the subtropical inflow. Additionally, the recently shown intrusion of subtropical waters into the Northeastern Atlantic (late 1960's, early 1980's and 2000's) are shown to primarily occur during periods of weak MOC circulation at A25-Ovide.