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Mass transport of the North Atlantic meridional overturning circulation using hydrographic data and Argo velocity measures

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The North Atlantic meridional overturning circulation (MOC) has been studied through the analysis of hydrographic data obtained during the World Ocean Circulation Experiment. Two transatlantic sections were occupied along 24º and 36º N, providing a chance to calculate geostrophic velocities and mass transports across them. This MOC quantification is furthermore improved by the use of an inverse model, including mass conservation requirements. For the inverse solution the ocean is divided into 16 isopycnal layers, taking the neutral density value of γ_n = 28.072 kg m^{-3} as a reference level of assumed zero velocity, approximately at 3000 m depth. The velocity field across both hydrographic sections is estimated taking Ekman transport and freshwater flux into account, while applying a closed box bounded by the 24º and 36º N latitudes and the western and eastern basin margins. Results confirm previous hypothesis stating no abrupt decreases in the MOC during the last decades, by comparing 1957, 1981 and 1992-1993 data. Argo data in the North Atlantic are also used as an estimation of the velocity in the reference layer. Previously, an objective analysis is carried out for the Argo velocity field, following the principles of Optimal Statistical Interpolation, in order to estimate interpolated data onto the nodes of a regular grid, as available for hydrographic WOCE data. This procedure gives more accurate transport estimates of the North Atlantic MOC.