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Thirty years of GO-SHIP and WOCE data: Atlantic overturning of mass, heat, freshwater, and anthropogenic Carbon transport

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The Atlantic Meridional Overturning Circulation (AMOC) plays a vital role in global climate, redistributing heat, freshwater and anthropogenic CO₂ (Canth) meridionally and in depth. Accurately monitoring AMOC strength with observations has inspired a number of dedicated observing systems in the Atlantic since the 2000s. However, no consensus has been reached on whether the slowdown of the AMOC and its associated heat, freshwater and Canth transports is occurring. Hydrographic data and biogeochemical measurements from zonal sections across the Atlantic for 30 years that predate and overlap the era of AMOC observations were employed to build three inverse models, one for each of the last decades. The results show no changes in the AMOC for all sections analyzed over the whole Atlantic for the last 30 years. The change in time in the net transports of Canth appears to be mainly due to modifications in the transport of upper layers. The lower layer of the AMOC maintain more consistent transports in time. Vertical advection plays an important role in the North Atlantic, exporting Canth from upper to deeper layers. The strong gradient in Canth concentration at the interphase between upper and deeper layers results in a strong vertical diffusion.

Topic

Value of AMOC observing –what have we learned?

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