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GLOBAL OVERTURNING CIRCULATION: DOWN-GRADIENT FLOW AND FRESHWATER TRANSPORTS

The relation between the observed global overturning circulation, steric height distributions at all depths, and freshwater transports is examined. The global circulation is down-gradient in terms of the largest spatial scales of steric height distributions, at all depths from the surface to the bottom, based on observational syntheses. Diapycnal upwelling in both the Southern Ocean and the Indian/Pacific Oceans is integral to the global overturn. The Indian/Pacific Deep Waters return to the Southern Ocean, upwell to the sea surface, and feed the northward surface flows that eventually return to the North Atlantic. The remainder of the Indian/Pacific Deep Waters joins the upwelled North Atlantic Deep Water to form the large Antarctic Bottom Water overturning cell. The distribution of diapycnal fluxes depends mainly on the small salinity differences between ocean basins that arise from the pattern of atmospheric water vapor transports. The equatorward freshwater transports from the high latitude southern and northern hemispheres are carried by the surface overturning cells in the south, and by North Atlantic Deep Water and North Pacific Intermediate Water formation in the north.

<http://www.sgmeet.com/osm2012/viewabstract2.asp?AbstractID=10942>

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