

Boundary currents' responses to remote forcing: observations from the North Atlantic Line W and the North Pacific PN-line

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Regular in situ measurements are made along Line W in the North Atlantic and the PN-line in the North Pacific. These sections cross their respective basin's western boundary with stations descending the sloping topography offshore of the shelf break. Since 2004 moorings along Line W have measured the Deep Western Boundary Current (DWBC) – at high temporal and vertical resolution – as it flows equatorward between the shelf and poleward-flowing Gulf Stream. In contrast, the PN-line crosses a wind-driven sub-tropical western boundary current, the Kuroshio. Regular hydrography at the PN-line has been conducted since the 1960's, with occasional mooring deployments providing higher frequency observations. A striking feature of the North Atlantic's DWBC transport, comprising Labrador Sea and Overflow Waters, is its tremendous variability, with equatorward transport at Line W sometimes exceeding 100 Sv (compared to a 30 Sv mean). Likewise, the Kuroshio at the PN-line exhibits strong mesoscale variability, with mooring-inferred transport ranging between 4 and 30 Sv. Altimetry, hydrography, and wind-stress curl show interannual variability at the PN-line is a combined response to the large-scale wind stress curl field at two time scales, related to barotropic and baroclinic modes that reach the western boundary from the interior via different waveguides. Analogous processes may be relevant for interannual variability at Line W. Annual-mean SSH on the onshore side of Line W is positively correlated at zero-lag with SSH along a PV contour stretching from Cape Hatteras, northeastward while the offshore side of Line W is not correlated with remote SSH at zero-lag.