



The diffusive ocean conveyor

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We use a novel path-density transport diagnostic to trace out the deep branch of the ocean conveyor in a global circulation model. Our results suggest that the majority of the world's deep water is not transported back to the surface along the current systems of the standard great ocean conveyor. Standard conveyor routes are evident only for waters with interior residence times less than a thousand years, accounting for less than a quarter of the ventilation-to-re-exposure flux. Waters with longer residence times are spread across the deep oceans by the "diffusive conveyor" and asymptote to a universal deep-North-Pacific (DNP) pattern. The DNP pattern is dominated by eddy diffusion and reflects the longest-lived mode of ocean transport. Observed depletion of oxygen and ^{14}C in the deep North Pacific is consistent with a diffusive conveyor and should not be interpreted as evidence of an advective terminus of the GOC deep branch. Contrary to the traditional view, our results demonstrate that eddy-diffusion is crucial in organizing the bulk of oceanic surface-to-surface transport.