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Is horizontal convection really "non-turbulent"? ALBERTO SCOTTI, Dept. Marine Sciences, UNC-CH, BRIAN WHITE, Dept. of Marine Sciences — The oceanic Meridional Overturning Circulation (MOC) is the slow residual motion that turns over the world ocean over a millennial time scale. What drives the MOC has been the subject of intense speculation. Equatorial heating and polar cooling, i.e. horizontal convection (HC), would seem to be a natural candidate to drive (at least partially) the MOC, but within the oceanographic community HC has been considered irrelevant or nearly so, based primarily on an inference based on a century old experiment by Sandström (1908), though all modern experiments contradict it (Hughes and Griffiths, 2008), and on a theoretical argument that would prevent HC to sustain a true turbulent flow (Paparella and Young, 2002), the latter deemed necessary to achieve mixing. We revisit Paparella and Young's argument with the aid of DNS of HC at Rayleigh number up to 10^{10}. We argue that the latter argument is overly restrictive. On the contrary, analysis of invariants (such as Q-R plots) show that HC possesses the characteristic of turbulent flows. The surprising result is that HC can transport very large quantities of heat and sustain large amount of diapycnal mixing with a surprisingly small amount of dissipation. Hence, HC alone could be an important component behind the MOC, even though it cannot explain the levels of dissipation observed in the ocean, which have to be accounted from other sources.

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