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Mechanical energy budget for horizontal convection BISHAKHDATTA GAYEN, ROSS W. GRIFFITHS, GRAHAM O. HUGHES, JUAN A. SAENZ, Australian National University — A three dimensional direct numerical simulation is performed to study horizontal convection in a long channel at a large Rayleigh number (of $O(10^{12})$). A different temperature is applied over each half of the channel base and the flow is allowed to reach a state of thermal equilibrium in which there is no net heat input. The circulation and temperature field accords with that observed in previous experiments and numerical simulations, and we focus on understanding horizontal convection from an energetics viewpoint. All terms in the mechanical energy budget can be evaluated explicitly, and we use this methodology to show how a strong circulation can be maintained despite the tight constraints on viscous dissipation in the flow established by previous work. An important conclusion is that horizontal convection represents a highly efficient mechanism of mixing in a stratified fluid.

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