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Lateral spreading in a steady turbulent density current from an isolated source ANDREW WELLS, JOSH VIVIAN, University of Oxford — Turbulent buoyancy-driven flows on slopes occur in a range of environmental settings, such as dense ocean overflows, atmospheric katabatic winds, meltwater flows under ice shelves, or discharge of industrial effluents. A convenient modelling approach for dense currents from isolated sources considers a so-called "streamtube approximation," averaging over the cross-section of the current to yield an effectively one-dimensional model for the evolution of flow along a streamline. However, such modelling approaches typically parameterise any changes in current width, rather than directly predicting the dynamics of lateral spreading. To build insight into the relevant dynamics, we consider steady density currents flowing down a planar slope, supplied by a continuous buoyancy flux from an isolated source. A model is developed to describe the downslope evolution of flow averaged over the width and depth of the current, including a new dynamical treatment of lateral spreading. We analyse theoretical and numerical solutions, before comparing to laboratory experiments with a dense saline current flowing down a slope.

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