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Downwelling in Boundary Currents Subject to Buoyancy Loss¹ CLAUDIA CENEDESE, Woods Hole Oceanographic Institution — Recent observational, theoretical, and modeling studies all suggest that the upper part of the downwelling limb of the thermohaline circulation is concentrated in strong currents subject to buoyancy loss near lateral boundaries. This is fundamentally different from the traditional view that downwelling takes place in regions of deep convection. Theoretical understanding of what controls the downwelling near boundaries (its magnitude, length scales) is weak and relies on parameterizations of poorly known turbulent mixing processes. In this study, laboratory experiments were carried out to explicitly resolve the turbulent mixing due to convective plumes and identify where downwelling takes place. The dependence of the downwelling, circulation, and free surface temperature on the non-dimensional parameters that describe the boundary current and surface forcing will be discussed. The laboratory results are compared to previous theories and numerical models for downwelling boundary layers, to determine whether the details of these small-scale turbulent processes need to be explicitly resolved in order to represent their influence on the larger-scale circulation.

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