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On the propagation of a gravity current into a fluid with horizontal and vertical density gradient HIEU PHAM, SUTANU SARKAR, University of California, San Diego — Large-eddy simulations are used to investigate the dynamics of a rotating gravity current propagating in the ocean surface mixed layer on top of a pycnocline. Two simulations with different conditions in the surface mixed layer are performed: one with a homogenous mixed layer and one with a horizontal density gradient. In the latter case, the density in the mixed layer decreases with propagating distance. In both cases, a nonlinear bore forms at the front of the gravity current with Kelvin-Helmholtz billows that develop below and in the region behind the bore. In the case with a homogeneous mixed layer, the bore propagates at a constant speed which is proportional to $\sqrt{g'H}$ where g' is the reduced gravity and H is the mixed layer depth. In the case with the horizontal gradient, the speed decreases in time. It is found that the horizontal density gradient influences the propagation of the bore in the following ways: (1) It reduces the buoyancy difference which drives the bore; (2) It generates a horizontal pressure gradient which drives a counter gravity current opposing the bore. The counter current creates a flow-converging zone ahead of the bore. The speed of the bore is found be dependent of the horizontal density gradient and the traveling distance of the bore.

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