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## Plankton accumulation in nonlinear internal phenomena: Results from a high-resolution 3D numerical model

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It has long been realized that nonlinear internal phenomena (gravity currents or internal waves) can accumulate plankton material and contribute to cross-shore transport. Previous modeling work (Helfrich and Pineda, J. Limn. Ocean. 2003) used the flow field of a two-dimensional, time averaged gravity current to estimate accumulation. Here, we extend this work to three-dimensional, steady state but not time-averaged internal phenomena to measure the accumulation rate in gravity currents and nonlinear waves with trapped cores. We take advantage of recent experiments on the behavior of barnacle nauplii to model the response of plankton in our experiments. We show that the simple strategy of swimming up to maintain position when exposed to downwelling currents can lead to accumulation, and we quantify it in relation to the maximum swimming speed and position. We also show that accumulation is not in general uniform, which has important applications for planning and interpreting observations.