Transformation of a first mode internal solitary wave on a step in a three-layer flow

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Using the MITgsm model the process of interaction of the first mode solitary wave with bottom step in three-layer flow is studied numerically. Because in three layer flow two modes of the internal waves exist, such interaction is one of mechanisms of generation of the second-mode internal waves. The second mode internal solitary waves appear in the reflected wave field as well as in the transmitted wave field, but the latter solitary wave amplitudes are very small. Dependence of the second-mode solitary wave amplitude on the incident wave amplitude is studied. It is shown that the amplitudes of the secondary solitary waves of the second mode are comparable with the amplitudes of the first mode solitary waves after the step. Usually the secondary solitary waves of the second mode are convex but for some stratification conditions can be convex. The Lagrangian particle trajectories in pycnocline, near-bed, and near-surface layers are computed, and great qualitative differences among them are shown.