Density current descending a continental slope in the ocean

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We have investigated dynamic processes of density current and associated transport processes of dense water on a sloping bottom, using a three-dimensional nonhydrostatic numerical model. Special attention is given to effects of the earth's rotation (the Coriolis parameter) and bottom slope.

The dense water descends the sloping bottom in a thin bottom Ekman layer in the early stage, during which unstable waves due to baroclinic instability have small amplitudes. The Ekman volume transport reduces with increasing earth's rotation, and it is larger in steep slope cases than in gentle slope cases. The unstable waves grow faster with increasing earth's rotation and increasing bottom slope.

In the mature stage, during which the unstable waves have finite amplitudes, the dense water is effectively transported offshore by eddies. The offshore eddy transport becomes less efficient with increasing earth's rotation and increasing bottom slope.

The mechanisms of these phenomena are also examined in detail.