Abstract View

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Linear Instability of a Current Flowing Along a Bottom Slope Using a Three-Layer Model

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ABSTRACT

A quasi-geostrophic model of a three-layer fluid on an *f*-plane is employed to study instability of a current flowing over a uniform bottom slope with isobaths parallel to the current. The model has a basic flow only in the uppermost layer but no basic motion in the middle or lowest layer (or no relative motion between the two lower Layers). The two lower layers representing a lower ocean have a relatively small density difference which is not considered in traditional two-layer models. In addition to a deep baroclinic mode which is nearly homogeneous in the two lower layers, a surface-intensified, baroclinic mode whose amplitude in the lowest layer is negligible grows in the case of a realistic slope. The jet-like basic flow whose half-width is comparable to a deformation radius also supports a barotropically unstable mode maintained by a horizontal shear in the basic flow. This mode becomes less active as the jet width increase or as the jet approaches a vertical side boundary modeled after a steep continental slope.