## Abstract View

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# Topographically-Induced Baroclinic Eddies near a Coastline, with Application to he Northeast Pacific

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ABSTRACT

A mathematical model is developed to describe the interaction between variable bottom topography and a steady, horizontally-sheared baroclinic coastal current. The topography modeled in this study consists of an offshore seamount and a seaward protrusion of the continental slope. The fluid motions are assumed to conserve potential vorticity on the *f*-plane, and expressions for the pressure, density, velocity and mass transport fields are obtained using a normal mode analysis and the appropriate Green's function for the horizontal problem.

The theory is applied to the northeast Pacific Ocean in an attempt to model the anticyclonic eddy which has been observed by Tabata west of Sitka, Alaska. The numerical calculations of the model and the observed location, dimensions, velocities and transports of the Sitka eddy are in good agreement.

The axial velocities and dimensions of the calculated eddy field are largest for upstream surface and bottom currents of approximately 5–7 and 1–2 cm $s^{-1}$, respectively. When the surface current is greater than about 20 cm $s^{-1}$ or less than 0.5 cm $s^{-1}$ there are no closed streamlines on the surface. It is therefore conceivable that the season in which the eddy is usually generated (spring-summer) and the particular years in which the eddy is observed to occur are a consequence of seasonal and interannual changes in the upstream current. In particular, it is conjectured that these interannual current changes (and hence the years of eddy occurrence) may be related to interannual variations in the atmospheric circulation in the Gulf of Alaska, which in turn are sometimes linked with El Niño-Southern Oscillation episodes in the tropical Pacific.

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