Abstract View

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Formation of Eddies and Transverse Currents in a Two-Layer Channel of Variable Bottom with Application to the Lower St. Lawrence Estuary

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ABSTRACT

Baroclinic shelf waves and Kelvin waves in a two-layer channel of variable bottom are discussed using a simple numerical model. Two different propagation directions are shown to be possible, analogous to the existence of shelf waves and trench waves in an ocean bounded by a coast with a trench, described by Mysak *et al*. The eigenfunctions of baroclinic shelf wave modes are quite different from the barotropic eigenfunctions; that is, each of the baroclinic modes shows a pattern similar to the first mode with the exception of small scale structures near the coast. The model also shows the formation of a series of eddies with alternating rotation sense accompanied by transverse currants between two successive eddies.

Eddies and transverse currants were observed in the upper layer of the lower St. Lawrence estuary based on four months of direct measurements taken in 1979. The observed wavelike motion with a period of about 80 days and a wavelength of 75 km corresponded to the fourth baroclinic shelf wave modes. The observed near-surface circulation patterns with important variability in space and time are thus explained by the superposition of two baroclinic shelf waves propagating in opposite directions.

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