Abstract View

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Coastal-Trapped Waves in Continuously Stratified Channels. Part I: Numerical Description of Behavioral Properties

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ABSTRACT

A numerical model which solves the linearized, quasi-geostrophic potential vorticity equation is used to describe free subinertial coastal-trapped wave (CTW) properties in channels with variable depth in the offshore direction, and with surface intensified buoyancy frequency profiles $N^2(z)$ as found in large and deep estuaries. The variational form of the pressure equation reveals that CTWs propagate slower in channels as compared to those on continental shelves, due to the bottom slope reversal between the channel shores. Significant phase speed reduction occurs when the effective channel stratification parameter in O (1) or higher. Without coastal walls, phase speeds of long topographic waves increase with channel width and vertical averaged N^2, but decrease with channel concavity and N^2 surface intensification. Bottom-trapped motion is enhanced in channels relative to that on continental shelves, again due the bottom slope reversal. In the presence of coastal walls, hybrid waves are less affected by the midchannel bottom slope reversal. No “kissing”phenomenon is detected in the dispersion relations for channels with surface or subsurface (two-layer) N^2 intensification.

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