Abstract View

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On Coastal Trapped Waves: Analysis and Numerical Calculation by Inverse Iteration

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ABSTRACT

Waves of sub-inertial frequency in a continuously stratified ocean and trapped over a continental shelf and slope are considered. They form one infinite discrete sequence of modes with frequencies decreasing to zero. The mode frequencies increase with stratification. All modes progress with the coast on their right in the Northern Hemisphere. In three formal asymptotic limits the waves adopt special forms: (1) large longshore wavenumber [Rhines (1970) bottom–trapped waves]; (2) small stratification [barotropic continental shelf waves]; and (3) large stratification [baroclinic (internal) Kelvin-like waves].

These results are illustrated by numerical calculations using the method of inverse iteration, which avoids time integration. Further calculations demonstrate the strong influence of the depth and density profiles on the wave forms. In particular, a realistic context (i.e., a gently sloping shelf bounded by a steeper continental slope, together with greater stratification near to the surface) appears to concentrate the motion over the upper slope and shelf, where it tends to be barotropic.