Abstract View

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Influence of a Mid-Ocean Ridge on Wind-Driven Barotropic Rossby Waves

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ABSTRACT

An analytical study investigates the influence of a mid-ocean ridge in a barotropic ocean on the energy radiation by wind-driven, quasi-geostrophic, linear Rossby waves. The ocean basin is bounded on the east and west by meridional boundaries and is separated in its middle by a north-south ridge with zonal exponential depth profiles. The forcing function is oscillatory, either propagative or not, and represented by one or a linear combination of plane waves. The excitation frequencies range from a week to about six months (the chosen spin-down time for Rossby waves). High-frequency forcings (about 10-days period) excite basin-size topographic Rossby-modes propagating westward along the f/h contours. Low-frequency forcings (several-week period) excite Rossby-modes relative to each half basin, but modified by the bottom slope. At very low-frequencies (several-month period), Rossby wave reflection and bottom friction set up a boundary layer at the western boundary of the basin but no such sign significantly appears at these frequencies on the eastern flank of the ridge. When the forcing is not zonally uniform, the position of the maximum of the wind-stress curl relative to the ridge appears to be a parameter that significantly influences the ocean response.