Abstract View

Volume 13, Issue 9 (September 1983)

Journal of Physical Oceanography
Article: pp. 1659–1668 | Abstract | PDF (657K)

Freely Propagating Trench Waves on a Beta-Plane

Andrew J. Willmott and Arlene A. Bird

Department of Oceanography, Naval Postgraduate School, Monterey, CA 93940

(Manuscript received November 12, 1982, in final form May 29, 1983)

DOI: 10.1175/1520-0485(1983)013<1659:FPTWOA>2.0.CO;2

ABSTRACT

The dispersion relation is derived for trapped freely propagating barotropic long trench waves on a midlatitude β-plane. It is found that a critical wavenumber k_c, which depends on trench orientation and wave frequency, partitions the behavior of each mode. Leaky modes occur when the wavenumber k of a particular mode satisfies $k<k_c$, in which case the mode takes the form of a linear barotropic Rossby wave in the ocean interior which radiates energy offshore. Coastally trapped solutions occur when $k>k_c$. For this latter case the solutions are spatially damped as they propagate along the trench. Dispersion curves are presented for the coastally trapped solutions along the Japan, Kuril and Peru trenches. Surfaces of the mass transport streamfunction are also displayed for both evanescent and propagating solutions along the Japan, Kuril and Peru trenches. The theory suggests that leaky trench waves might be a generating mechanism for barotropic Rossby waves in the Pacific Ocean basin.