Abstract View

Volume 15, Issue 7 (July 1985)

Journal of Physical Oceanography
Article: pp. 997–1007 | Abstract | PDF (967K)

How Much Energy Propagates Vertically in the Equatorial Oceans?

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(Manuscript received July 2, 1984, in final form April 2, 1985)

DOI: 10.1175/1520-0485(1985)015<0997:HMEPVI>2.0.CO;2

ABSTRACT

Vertically propagating linear wave calculations using realistic equatorial buoyancy profiles are presented which show the percentage of the downward surface energy flux that reaches the deep equatorial oceans. The percentages vary widely depending upon the buoyancy profile and the equivalent depth but can be as low as 10% on average for equivalent depths between 1 cm and 1 m if the thermocline is sharp. This means that models with constant or weak thermocline buoyancy profiles, which allow all or most downward surface energy flux to reach the deep ocean, are very unrealistic in this respect. Another conclusion is that the observed, very low-frequency, small vertical-scale deep jets cannot be explained by linear wave theory as caused by surface forcing. It is also shown that a WKB analysis of observations can be misleading even if applied to a single vertically propagating wave in a region that excludes the main thermocline. Implications are that comparing estimates of the equivalent depth from the mixed Rossby-gravity wave dispersion relation and a WKB analysis is of little value because the error bars on both estimates are large, and that WKB estimates of downward vertical energy flux into the deep ocean can also be misleading.