Abstract View

Volume 10, Issue 6 (June 1980)

Journal of Physical Oceanography
Article: pp. 900–905 | Abstract | PDF (525K)

Dissipation Mechanisms and the Importance of Eddies in Model Ocean Energy Budgets

D.E. Harrison

Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge 02139

(Manuscript received August 20, 1979, in final form January 23, 1980)

DOI: 10.1175/1520-0485(1980)010<0900:DMATIO>2.0.CO;2

ABSTRACT

The importance of mesoscale eddies in the basin energy budgets of closed-basin numerical model oceanic systems that attempt to resolve such motions varies greatly from calculation to calculation. In existing calculations, eddy importance has been found to depend strongly on the dissipation mechanism(s) selected. These energy budget results can be understood by examination of how eddy and mean flow kinetic energy are dissipated in the long-time mean in the different regions of the model flow. Scale analysis arguments are presented, assuming that the characteristics of the flows satisfy certain mild quasi-oceanic constraints, to investigate these dissipation terms. From these scale. estimates it appears that many of the model ocean results can he understood in terms of a nondimensional parameter that measures the relative importance of horizontal and bottom friction dissipation. When horizontal friction dissipation dominates, eddies can only be of modest importance in basin energy budgets, but when bottom friction dissipation dominates, eddies generally must be important. This follows simply from the assumed flow characteristics. The implications of these results on the interpretation of present modeling results are described.