Abstract View

Volume 18, Issue 10 (October 1988)

Journal of Physical Oceanography
Article: pp. 1354–1371 | Abstract | PDF (1006K)

Vertical Structure of Midlatitude Mesoscale Instabilities

Aike Beckmann

Institut f`r Meereskunde an der Universität Kiel, Kiel, FRG

(Manuscript received November 12, 1987, in final form March 4, 1988)

DOI: 10.1175/1520-0485(1988)018<1354:VSOMMI>2.0.CO;2

ABSTRACT

Instability processes in frontal jet regions outside the western boundary currents are examined for their ability to produce mesoscale variability comparable to that observed in the open ocean. The important of sufficient numerical resolution for a correct modeling of these processes is considered.

Using a local β-plane quasi-geostrophic multilevel model with periodic horizontal boundary conditions, the combined effects of special density and current profiles typical for the midlatitude eastern North Atlantic are studied. The linearized approach yields a set of vertical shear modes with different vertical structure depending on the zonal wavelength of the perturbation. Some of these shear modes are unstable; the mesoscale range (50–500 km) reveals two different types; a surface intensified shear mode and a deep-sea intensified one. The growth rates of the former are usually largely exceeding those of the latter due to the larger velocities and shears. Their exponential amplification time scale ranges from one to three weeks.

In the nonlinear model idealized initial states are integrated in time for about two months. Stochastically or locally perturbed jets produce strong meandering including eddy detachment. The initial growth rates are comparable with linearized theory and the vertical structure can be illustrated in terms of linear shear modes.

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.