## Abstract View

Volume 16, Issue 5 (May 1986)

**Journal of Physical Oceanography**
Article: pp. 838–855 | Abstract | PDF (1.22M)

# The Evolution of Balanced, Low-Mode Vortices on the β-Plane

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(Manuscript received June 11, 1985, in final form November 1, 1985)

DOI: 10.1175/1520-0485(1986)016<0838:TEOBLM>2.0.CO;2

ABSTRACT

Numerical solutions are examined for nearly axisymmetric geopotential monopole vortices whose vertical structure is essentially confined to the lowest few vertical modes. The vortex environment is a rotating, stratified fluid with spatially variable Coriolis frequency (the β-plane). Solutions are examined with Rossby numbers in an order one range about zero, and therefore the balance equations are and appropriate model. Solutions From the quasi-geostrophic and primitive equations are also examined, and we find that the balance equations are much more accurate than the former and more efficient, both conceptually and computationally, than the latter. The central parameter regime is one of stable vortex propagation, accompanied by week Rossby wave radiation and slow changes in vortex shape, with the latter due more to the radiation than the weak dissipation. Various types of instability—baroclinic, barotropic, and inertial—act to delimit the stable regime for vortices.