Abstract View

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Evolution of Isolated Interior Vortices in the Ocean

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ABSTRACT

The beta effect on the evolution of intrathermocline vortices, such as anticyclonic Mediterranean Water eddies (meddies), is investigated in a quasigeostrophic numerical model with fine high vertical resolution.

The authors define two types of structure for isolated vortices depending on the strength of relative vorticity in comparison with vortex stretching. When stretching dominates, the potential vorticity structure consists of poles of opposite sign primarily distributed along the vertical axis. In that case, interactions among the poles can drastically influence the propagation by increasing both the mean speed and its temporal variability. The trajectories are then highly dependent on the initial vertical structure of the vortex. They exhibit loops, cusps, and stagnation phases, and the mean propagation is generally southwestward at a speed of 1–2 cm s^{-1} for an anticyclone. Sometimes a steadily translating structure (modon) emerges and propagates eastward. These modons are persistent (hence stable), and they have a strong axisymmetric component plus a dipolar barotropic component.