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On the Evolution of Nonlinear Planetary Eddies Larger than the Radius of Deformation

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ABSTRACT

The properties of a new equation governing the evolution of planetary eddies larger than the radius of deformation are numerically investigated. Two types of dynamical balances showing remarkable solitary behavior are found. The first is the balance between the weak dispersion due to the planetary beta-effect and the weak nonlinearity due to the continuity equation. Only anticyclonic eddies are extremely long-lived due to this balance. The second is the balance between weak lateral advection due to a particular westward flow and weak planetary dispersion. The collision experiment shows robustness of the two-dimensional solitary eddy, suggesting the existence of a two-dimensional soliton of the latter type.

Also discussed is the relevance of our results to the evolution of the anticyclonic eddies off the Pacific coast of Central America reported by Stumpf and Legeckis (1977).

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