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Extended Nonlinear Theory for Topographic Rossby Waves

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The nonlinear-dispersive theory is proposed for topographic Rossby waves of small but finite amplitude for the case when external conditions (Coriolis parameter and ocean depth) are changed mainly along one direction, and wave is propagating along the orthogonal direction. The theory is based on the asymptotic procedure applied to hydrodynamic equations of frictionless, vertically homogeneous, incompressible, rotating fluid. The procedure includes series expansions of hydrodynamic fields by small parameters of nonlinearity and topographic dispersion. As a result, temporal evolution and spatial transformation of Rossby wave field is described by nonlinear evolution equation of second order in small parameters.

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