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On the "arrest" of inverse energy cascade and the Rhines scale BORIS GALPERIN, College of Marine Science, University of South Florida, St. Petesburg, Florida, SEMION SUKORIANSKY, Department of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel, NADEJDA DIKOVSKAYA — The idea of the "arrest" of the inverse energy cascade in twodimensional turbulence with a β -effect has been promulgated in meteorological and oceanographic literature for the last 30 years. The arrest is associated with the interaction between turbulence and Rossby waves. In relation to the arrest, Rhines (1975) has introduced a scale, $L_R = (2U/\beta)^{1/2}$, obtained by equating the r.m.s. velocity U to the phase speed of the Rossby wave. It has been widely accepted that L_R is a scale at which the nonlinear turbulent cascade gives way to propagation of linear Rossby waves. This interpretation, as well as the notion of the cascade arrest have been used in theories of large-scale atmospheric and oceanic circulations. We revise the notion of the cascade arrest in the context of continuously forced flows and demonstrate that the idea of the cascade arrest by a β -effect, in the naive sense of a transition from a nonlinear to a linear regime is fallacious; the up-scale energy propagation can only be absorbed by friction. Furthermore, L_R cannot be related to the transition between the regimes of nonlinear turbulence and linear wave propagation. Spectral analysis in the frequency domain shows that Rossby waves coexist with turbulence on scales much smaller than L_R .

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