Abstract Submitted
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A Mechanism for the Formation of Jets and Vortices in Rotating Flows[1] LESLIE SMITH, University of Wisconsin, Madison, YOUNGSUK LEE, Simon Fraser University — Numerical simulations of 'reduced models' including only near-resonant triad interactions are compared to full simulations of 3D rotating flow and 2D beta-plane flow forced randomly at small scales. In 3D rotating flow at moderate Rossby numbers, Smith and Lee (2005) showed that near resonances capture the important characteristics of the full simulations: efficient energy transfer to large scales, the formation of vortical columns, and symmetry breaking in favor of cyclones. Neither non-resonances nor near-2D interactions reproduce those features. On the beta-plane at moderate Rhines numbers, near resonances are responsible for the formation of large-scale zonal flows. As in full simulations with linear damping, they lead to symmetry breaking in the meridional derivative of the zonally averaged vorticity. The flow generated by near resonances is shown to be marginally stable according to the Rayleigh-Kuo theorem.

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