Equilibration of Rossby waves

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The dynamics of barotropic, non-divergent flow on a rotating sphere are described by the conservation of absolute vorticity. The normal modes are the well-known Rossby-Haurwitz waves which represent the natural oscillations of the system. Triads of these waves exist which satisfy conditions for resonance. The barotropic vorticity equation is linearized about a zonal flow depending only on latitude. The resulting equation is reduced, by a perturbation technique to the three-wave equations with pumping and damping. We investigate the equilibration of barotropically unstable Rossby waves in this case. Since the system is not integrable, we examine the solutions numerically. We find that both regular and chaotic solutions exist, the nature of the solutions depending sensitively on the parameters. Implications for atmospheric dynamics are considered.