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Statistical state dynamics of jet/wave coexistence in beta-plane turbulence NAVID CONSTANTINOU, Scripps Inst. of Oceanography, Univ of California - San Diego, BRIAN FARRELL, Department of Earth and Planetary Sciences, Harvard University, PETROS IOANNOU, Physics Department, National and Kapodistrian University of Athens — Jets are commonly observed to coexist in the turbulence of planetary atmospheres with planetary scale waves and embedded vortices. These large-scale coherent structures arise and are maintained in the turbulence on time scales long compared to dissipation or advective time scales. The emergence, equilibration at finite amplitude, maintenance and stability of these structures pose fundamental theoretical problems. The emergence of jets and vortices from turbulence is not associated with an instability of the mean flow and their equilibration and stability at finite amplitude does not arise solely from the linear or nonlinear dynamics of these structures in isolation from the turbulence surrounding them. Rather the dynamics of these large-scale structures arises essentially from their cooperative interaction with the small-scale turbulence in which they are embedded. It follows that fundamental theoretical understanding of the dynamics of jets and vortices in turbulence requires adopting the perspective of the statistical state dynamics (SSD) of the entire turbulent state. In this work a theory for the jet/wave coexistence regime is developed using the SSD perspective.

Navid Constantinou
Univ of California - San Diego

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