Geophysical Research Abstracts
Vol. 14, EGU2012-5907, 2012
EGU General Assembly 2012


# Emergence and maintenance of coherent vortices by stochastically forced Vortex Rossby Waves

N. Bakas and P. Ioannou

National and Kapodistrian University of Athens (nikos.bakas@gmail.com)

Large scale, coherent and intense vortices are often observed to persist in turbulent flows. In this work we explore a dynamical mechanism for vortex emergence and persistence: the vortices are maintained by axisymmetrization of stochastically forced asymetric eddies, that are typically termed as Vortex Rossby Waves (VRW). To achieve a comprehensive understanding of this physical mechanism we use Stochastic Structural Stability Theory (SSST). According to SSST, the distribution of momentum fluxes arising from the field of asymmetric eddies (VRW) associated with a given mean vortex structure, is obtained using a linear model of stochastic turbulence. The resulting momentum flux distribution is then coupled with the equation governing the evolution of the mean vortex to produce a closed set of VRW/mean vortex equations. We apply the SSST tools to a two dimensional, non-divergent model of stochastically forced VRW. We show that for stochastic forcing with amplitude larger than a certain threshold, the statistical equilibrium with no mean vortex is unstable leading to the emergence of an exponentially growing vortex. We also investigate the characteristics and structure of the finite amplitude vortex that is established after the equilibration of the initial instability and discuss the VRW-mean vortex dynamics that maintain the vortex.