Geophysical Research Abstracts
Vol. 14, EGU2012-4379, 2012
EGU General Assembly 2012

The vertical structure of geostrophic turbulence: statistical mechanics approach.

A. Venaille (1), G.K Vallis (2), and S. M. Griffies (2)

(1) Laboratoire de Physique, ENS-Lyon, France (antoine.venaille@ens-lyon.org), (2) NOAA/GFDL/Princeton University, NJ 08540, US

The vertical structure of freely evolving, continuously stratified, quasi-geostrophic turbulence is investigated. We predict the final state organization, and in particular its vertical structure, using statistical mechanics and these predictions are tested against numerical simulations. In general, the conservation laws, and in particular that enstrophy is conserved layer-wise, prevent complete barotropization, i.e. the tendency to reach the gravest vertical mode. The peculiar role of the beta-effect, i.e. of the existence of planetary vorticity gradients, is discussed. In particular, it is shown that increasing beta increases the tendency toward barotropization through turbulent stirring. In addition, it is shown that in the presence of sufficiently large bottom topography anomalies, an initial surface-intensified velocity field evolves towards a bottom-trapped mean current following iso-contours of topography.