Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

3D Baroclinic Vortices in Rotating Stratified Shear: from an Orange Great Red Spot to Planet Formation PEDRAM HASSANZADEH, PHILIP MARCUS, UC Berkeley — The presence of horizontal shear strongly influences the dynamics of vortices in rotating stratified flows. Examples of such vortices are the Jovian vortices in zonal shear, and the vortices of the protoplanetary disks in strong Keplerian shear. Studying the physics of these vortices and their interaction with the environment requires high-resolution 3D simulations: ignoring the vertical direction or lack of enough resolution eliminates or changes important physical processes such as the secondary circulation. This ageostrophic flow might be essential in dust accretion and planet formation in protoplanetary disks, and a key in longevity, color, and color-change of Jovian vortices. For example, the very recent (July 2012) color change of the Great Red Spot to pale orange is most likely created by such secondary circulation. We have used high-resolution 3D numerical simulations of the Boussinesq equations to study 3D baroclinic vortices embedded in rotating stratified shear. We discuss the physics of their secondary circulation its ability to transport red chromphores and dust particles. We also present preliminary results on the interaction of vortices with shear, and show how this interaction affects their longevity.

Pedram Hassanzadeh
UC Berkeley

Date submitted: 02 Aug 2012 Electronic form version 1.4