Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Large-scale numerical simulation of rotationally constrained convection[1] MICHAEL SPRAGUE, University of California, Merced, KEITH JULIEN, University of Colorado at Boulder, EDGAR KNOBLOCH, University of California, Berkeley, JOSEPH WERNE, Northwest Research Associates, JEFFREY WEISS, University of Colorado at Boulder — Using direct numerical simulation (DNS), we investigate solutions of an asymptotically reduced system of nonlinear PDEs for rotationally constrained convection. The reduced equations filter fast inertial waves and relax the need to resolve Ekman boundary layers, which allow exploration of a parameter range inaccessible with DNS of the full Boussinesq equations. The equations are applicable to ocean deep convection, which is characterized by small Rossby number and large Rayleigh number. Previous numerical studies of the reduced equations examined upright convection where the gravity vector was anti-parallel to the rotation vector. In addition to the columnar and geostrophic-turbulence regimes, simulations revealed a third regime where Taylor columns were shielded by sleeves of opposite-signed vorticity. We here extend our numerical simulations to examine both upright and tilted convection at high Rayleigh numbers.

[1]Computation time provided on the Columbia supercomputer under a NASA NLCS grant.

Michael Sprague
University of California, Merced

Date submitted: 03 Aug 2007 Electronic form version 1.4