Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Numerical Simulations of Rapidly Rotating Convection with Boundary Topography MICHAEL CALKINS, JEROME NOIR, JEFF ELDREDGE, JON AURNOU, University of California, Los Angeles — The Earth's magnetic field is generated by vigorous convective motions in the molten iron outer core. Observations over the last 400 years show that while many of the morphological features of the geomagnetic field change over time, others appear to have remained fixed relative to the Earth's solid mantle. In addition, investigations of the Earth's rotation rate, or length of day (LOD), show that the mantle and core are strongly coupled. One possible mechanism to explain the geomagnetic field and LOD observations is the interaction of convective motions with topographic features at the core-mantle boundary (CMB). To examine the effects of CMB topography on the dynamics of the Earth's core, we present results from a suite of quasigeostrophic, thermal convection simulations with boundary topography. The primary effects of the topography are an increase in heat flow and zonal flow magnitude. We find that the topography leads to the formation of closed streamlines in the lee of the topography, bearing resemblance to the structures observed in the geomagnetic field. Furthermore, the effects of the topography become more pronounced as the Ekman number is reduced, suggesting CMB topography may be important in controlling the convective dynamics in the core.

Michael Calkins
University of California, Los Angeles

Date submitted: 03 Aug 2010 Electronic form version 1.4