Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Convection-driven dynamos in the limit of rapid rotation MICHAEL CALKINS, LOUIE LONG, DAVID NIEVES, KEITH JULIEN, Univ of Colorado - Boulder, STEVEN TOBIAS, University of Leeds — Most large-scale planetary magnetic fields are thought to be driven by rapidly rotating convection. Direct numerical simulation (DNS) remains an important tool for investigating the physics of dynamos, but remains severely restricted in parameter space relative to geo- and astrophysical systems. Asymptotic models provide a complimentary approach to DNS that have the ability to access planetary-like magnetohydrodynamical regimes. We utilize an asymptotic dynamo model to investigate the influence of convective flow regime on dynamo action. We find that the spatial characteristics of the large-scale magnetic field are dependent only weakly on changes in flow behavior. In contrast, the behavior of the small-scale magnetic field is directly dependent on, and therefore shows significant variations with, the small-scale convective flow field. These results may suggest why many previous DNS studies, which reside in a vastly different parameter space relative to planets, are nonetheless successful in reproducing many of the observed features of planetary magnetic fields.

Michael Calkins
Univ of Colorado - Boulder

Date submitted: 31 Jul 2016 Electronic form version 1.4