Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Exploring the Deep Convection and Magnetism of A-type stars NICHOLAS FEATHERSTONE, High Altitude Observatory, MATTHEW BROWNING, Canadian Institute for Theoretical Astrophysics, ALLAN SACHA BRUN, SAp, CEA Saclay, JURI TOOMRE, JILA/APS, Univ. Colorado — A-type stars have both a near-surface layer of fast convection that can excite acoustic modes and a deep zone of core convection whose properties may be probed with asteroseismology. Many A-type stars also exhibit large magnetic spots that are often attributed to surviving primordial fields of global scale in the intervening radiative zone. We have explored the potential for core convection in rotating A-type stars to build strong magnetic fields through dynamo action. Using the ASH code, we model the inner 30% by radius of a two solar mass A-type star, rotating at four times the solar rate and capturing the convective core and a portion of the overlying radiative envelope. Convection in these stars drives a strong retrograde differential rotation and yields a core that is prolate in shape. When dynamo action is admitted, the convection generates strong magnetic fields largely in equipartition with the dynamics. Remarkably, introducing a modest but large-scale external field threading the radiative envelope (which may be of primordial origin) can substantially alter the turbulent dynamics of the convective interior. The resulting convection establishes a complex assembly of helical rolls that link distant portions of the core and yield magnetic fields of super-equipartition strength.

Nicholas Featherstone
High Altitude Observatory

Date submitted: 25 Jul 2011 Electronic form version 1.4