Generation of a Dynamo Magnetic Field in a Protoplanetary Accretion Disk T. Stepinski and E. H. Levy, Lunar and Planetary Laboratory and Department of Planetary Sciences, University of Arizona, Tucson, Arizona 85721.

A new computational technique is developed that allows realistic calculations of dynamo magnetic field generation in disk geometries corresponding to protoplanetary and protostellar accretion disks. The approach is of sufficient generality to allow, in the future, a wide class of accretion disk problems to solved.

In this initial study, the basic modes of a disk dynamo are calculated. Spatially localized oscillatory states are found to occur in Keplerian disks. A physical interpetation is given that argues that spatially localized fields of the type found in these calculations constitute the basic modes of a Keplerian disk dynamo.

These results and the computational technique have general applicability to a variety of other cosmical disk systems including disk galaxies and high energy accretion disks around black holes and compact stars.

The Steady State Toroidal Magnetic Field at the Core-Mantle Boundary

S. J. Pearce and E. H. Levy, Lunar and Planetary Laboratory and Department of Planetary Sciences, University of Arizona, Tucson, Arizona 85721.

Recent measurements (Lanzerotti, et al., 1985) indicate that the strength of the toroidal magnetic field at Earth's core-mantle boundary is comparable to the strength of the poloidal field--5 to 10 gauss. Illustrative calculations are given to show that this result is an inevitable result of the external boundary condition on the core, in which the mantle electrical conductivity is several orders of magnitude lower than that of the core. The measurements are shown to imply that the internal core toroidal magnetic field is in the range of several hundred gauss. Thus the measurements imply that Earth's core contains a strong toroidal magnetic field and support the idea that Earth's dynamo--and, by implication, other planetary magnetic fields--involves efficient toroidal magnetic field generation through strong differential rotation.