Geophysical Research Abstracts, Vol. 9, 10826, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10826

MAC/MC - modes in variously stratified fluid layer with anisotropic diffusive coefficients

T. Soltis (1), J. Brestensky (1) and S. Sevcik (1)

(1) Dept. of Astronomy, Physics of the Earth and Meteorology, Faculty of Mathematics Physics and Informatics, Comenius University, Bratislava, Slovakia

Instabilities of MAC/MC waves type, arising in horizontal planar layer considered in various models of density stratification, i.e. unstably or stably stratified or with no stratification, are studied, respectively. The layer rapidly rotates about vertical axis of rotation and is permeated by azimuthal magnetic field linearly growing with distance from rotation axis. Diffusive coefficients (thermal diffusivity and viscosity) are anisotropic in the sense that the diffusivities are horizontally isotropic but they have various values in vertical and horizontal directions. We distinguish two types of anisotropy. In anisotropy of ocean type, the diffusivities are greater in horizontal directions and in anisotropy of atmospheric type in vertical direction, respectively. It is tacitly supposed that the anisotropy of diffusive coefficients is naturally related to the turbulent state of the Earth's core strongly influenced by the rotation, magnetic field and the density stratification. Considering various types of stratification we study MAC modes thermally or magnetically driven and MC modes driven by magnetic energy. It is confirmed that the ratio of magnetic and kinetic energy of instabilities is much greater for magnetically driven instabilities in comparison with thermally driven instabilities. Magnetically driven instabilities of MAC/MC waves type may control maximum value of magnetic field in the Earth's core. Our results indicate that the case of anisotropic diffusive coefficients of ocean type give the value of basic parameters (magnetic field, viscosity and typical frequencies) geophysically more realistic than in isotropic diffusivities or in the case of anisotropic diffusivities of atmospheric type. The possible role of the instabilities for explanation of the geomagnetic secular variation of periods $\sim 10^3$ years and for understanding the reasons of irregular magnetic field reversals is discussed.