Geophysical Research Abstracts, Vol. 9, 06992, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06992

An influence of a position of a critical level inside a horizontal layer on the rise of the magnetic and thermally driven instabilities

A. Marsenic (1), S. Sevcik (2)

(1) Geophysical Institute, Slovak Academy of Sciences, Bratislava, (2) Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, (marsenic@dgp.fmph.uniba.sk)

The system under consideration is a horizontal stratified plane layer between $z = \pm d/2$ filled by electrically conducting Boussinesq fluid rotating with a constant angular velocity $\Omega = \Omega\hat{z}$ under a vertical gravitational field $g = -g\hat{z}$ and a non uniform basic magnetic field B_0. An adverse temperature gradient $\vec{\beta}$ is applied to the layer. The imposed magnetic field in the form $B_0 = \mathcal{B}_0(z - z_0)\hat{y}$, where $\mathcal{B}_0$ is a magnitude of the field, $|z_0| < 1/2$, has a zero point inside the horizontal layer by what the condition of the existence of a critical level inside the layer is satisfied. The critical level in the middle of the domain corresponds to the purely antisymmetric field which is of so called dipolar parity. An influence of shifting of the critical level with respect to the central plane of the layer on the onset of an instability is studied. The linear stability analysis of the system is performed. Instabilities are sought in the form of stationary convection in dependence of dimensionless parameters (Rayleigh, Elsasser numbers) and in dependence of boundary conditions. Also magnetic instabilities are investigated for the layer without density stratification.