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Hydromagnetic instabilities in equatorial regions of the Earth's core influenced by anisotropic diffusive coefficients

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Hydromagnetic instabilities are studied in Cartesian geometry in the stratified horizontal fluid planar layer uniformly rotating about a horizontal axis. The layer is permeated by a homogeneous horizontal magnetic field. We consider four basic cases of anisotropic diffusive coefficients (thermal diffusivity and viscosity) - two types (So, Sa) of stratification anisotropy and two types (Bp, Bo) of anisotropy by Braginsky and Meytlis (1990). In the first two cases (So, Sa) the diffusive coefficients are horizontally isotropic but their horizontal values are distinct from the vertical value. In the oceanic type (So) of anisotropy the diffusivities are greater in the horizontal directions than in the vertical one, while in the anisotropy of atmospheric type (Sa) the vertical diffusivities are greater.

In the anisotropies by Braginsky and Meytlis (Bp, Bo) the eddy diffusivities are greater in the directions of magnetic field and rotation axis than in other direction(s). Thus if the magnetic field and the rotation axis are parallel, then the eddy diffusivities are greater in their common horizontal direction than in other two orthogonal directions (Bp). If the magnetic field and the rotation axis are orthogonal, but both in horizontal directions, then the diffusivities are greater in the horizontal directions than in the vertical one (Bo).

Our study is motivated by contradictory results of studies in spherical (Ivers and Collins 2007) and planar geometry (the horizontal planar layer rotating about the

vertical axis, Soltis and Brestensky 2004 - 7) by which the stratification anisotropy of Sa type facilitates convection in the planar geometry, but inhibits it in the spherical geometry. In So type anisotropy case it is contrary - the inhibition (facilitation) of convection is in the planar (spherical) geometry. Therefore, for explanation of the above indicated contradiction we expect e.g. that the convection in the horizontal planar layer rotating about the horizontal axis will be inhibited or facilitated by Sa or So anisotropy of diffusive coefficients like it is in the spherical geometry, but different from the case of horizontal planar layer rotating about the vertical rotation axis.