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Magnetic instabilities influenced by anisotropic viscosity in the Earth's core

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Anisotropy of diffusive coefficients is introduced in the model of rotating magneto-convection in rotating horizontal fluid layer permeated by azimuthal magnetic field linearly growing with distance from vertical axis of rotation in the way that it is possible to find separable solutions. This solution has the form of progressive wave propagating along azimuthal magnetic field. Thermally and magnetic driven instabilities (instabilities of MAC waves or MC waves type with turbulent diffusive coefficients) are developed. Instabilities of MC waves type are investigated. They need no stratification for their existence and they take the energy from magnetic field. These instabilities may act as valve to control magnitude of magnetic field. MC(W) modes catalyzed by viscosity are example of our previous studies of diffusive instabilities from the class of instabilities of MC waves type. They propagate only westward and they necessarily need relatively high viscosity for their existence although viscous forces are negligibly small in comparison with other dominant forces (Lorentz, Archimedean and Coriolis force). Properties of arising instabilities are changed significantly by introducing of anisotropy of diffusive coefficients and the change is the greater, the greater is deviation from isotropic case. MC(W) modes are sensitive only to viscous anisotropy, because MC waves unlike MAC waves are independent on thermal diffusion. Anisotropy may be a consequence of turbulent state in which the diffusive coefficients become tensor quantities. We distinguish horizontal directions (radial and azimuthal) and vertical direction (parallel to axis of rotation) in our model. Anisotropy is considered in the way that we suppose the coefficients of diffusivities in horizontal vertical directions different from coefficients in vertical direction (also with order differences). We consider two types of anisotropy of diffusive coefficients, i.e. anisotropy of oceanic type with diffusive coefficients in horizontal directions by orders greater than diffusive co-

efficient in vertical direction and vice versa in the other type of anisotropy which is analogical (but different) to anisotropy introduced by Braginsky and Meytlis (1990). Conditions of existence for MC(W) modes are studied in the same way as in isotropic case in dependence on many input parameters (Ekman number, Elsasser number, azimuthal and vertical wave number) by using a fact that Rayleigh number has zero value.