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Anisotropic diffusivities effects in Rotating Magnetoconvection study

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The Earth's Fluid Core is driven into motion by buoyancy forces so strongly that the flow and field are turbulent, fluctuating on many length and time scales, as it is accepted by the most of geophysicists. This turbulence may cause some phenomena, e.g. the turbulent diffusivities and even anisotropic ones with natural influence on the Core dynamics. So, it is very interesting to study how anisotropic diffusion processes work in the Geodynamo models or at least in linear Rotating Magnetoconvection models in horizontal plane layer with gravity and rotation axis in vertical direction and magnetic field in horizontal direction.
In this regard in our models we introduce anisotropy at least into one among diffusive coefficients (viscosity, thermal and magnetic diffusivity) in the simplest possible way. Corresponding anisotropic coefficients are diagonal tensors with two equal components different from the third one. All possible combinations of mixed isotropic and anisotropic diffusivities are studied and compared. In the full anisotropy case with all diffusivities anisotropic (including also magnetic diffusivity) the beta-effect is studied in its anisotropic version. Further, we analyze two distinct kinds of anisotropy, Stratification Anisotropy - SA, determined by direction of single gravity (buoyancy) force and Braginsky-Meytlis one – BM, determined by two directions – magnetic field and rotation axis. SA preserves and BM brakes a Horizontal isotropy in the models.
The system described by these models is prone to instabilities. We present in great depth only the stationary modes of instabilities. Arising modes of instabilities depend on input parameters. The BM anisotropy modes are very sensitive to parameters. We stress some important links between anisotropy and convection in the Earth's Core. The main result is that different anisotropy cases of diffusive coefficients may crucially affect the Geodynamo processes.