

Convection, Current and Magnetic field in Geodynamo Simulations with low Ekman number: Parameter Dependences

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We performed MHD geodynamo simulation with low Ekman number ($Ek=O(10E-7)$). We found that the convection structure changes compared with high Ekman number case. The convection structure becomes thin sheet plume. Magnetic and current fields produced by dynamo action under this convection motion have characteristic structure. Flux tubes and helical current coils are formed. The overview is reported in our companion talk by Kageyama and Miyagoshi.

In this paper, we report detail structures of convection, current, magnetic fields and comparison to other parameter cases. As Rayleigh number becomes small, the length of plumes becomes short. As Ekman number becomes large (about four to ten times), the width of the plumes becomes slightly wide. The length of the plumes becomes long. The plumes become to wind. The current coils are also formed in high Ekman number case, though in a less distinctive fashion.