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MHD geodynamo model including effect of length-of-day variation
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Correlation of geomagnetic field variation with length-of-day variation has been pointed out. For example, Hamano (1992) argued relation between geomagnetic field variation and length-of-day variation associated with Milankovitch cycle. However, there are no geodynamo models which take effect of length-of-day variation into consideration.

In this paper we show MHD geodynamo model including effect of length-of-day variation. The Yin-Yang dynamo model (Kageyama and Sato 2004, Kageyama et al. 2004) was developed to include this effect. In a momentum equation, rotation speed in Coriolis force term changes as time goes on by sin function. In addition, a new term concerning time differential of rotation speed is added. The Ekman number and Rayleigh number are 1.9E-5 and 1.5E8, respectively. Prandtl and magnetic Prandtl numbers are both unity. For reference, we initially solved without rotation speed variation and confirmed magnetic dipole moment is the largest one than other higher moments, and magnetic energy in the outer core is several times larger than the kinetic energy at saturated state. Our simulation results show that the length-of-day variation causes oscillation of magnetic energy, kinetic energy, and magnetic dipole moment. At the typical case, the amplitude of rotation speed variation is 2 percent. When the variation period is the same as magnetic diffusion time, the magnetic and kinetic energy, and magnetic dipole moment oscillate in that period. The amplitude of magnetic energy oscillation is about plus minus 25 percent. When the period is 1 percent of magnetic diffusion time, both the kinetic energy and magnetic dipole moment oscillate in that period. In this case the amplitude of magnetic dipole moment oscillation is about plus minus 0.7 percent.
Keywords: geodynamo, length-of-day variation