地球コア内の磁気不安定とダイナモ作用

桜庭 中 [1]
[1] 東京大・理・地球惑星

Magnetic instability and dynamo action in the Earth's core

Ataru Sakuraba[1]
[1] Dept. of Earth and Planetary Science, Univ. of Tokyo

There are many unknowns on the Earth's dynamo action because numerical simulations with Earth-like parameters are difficult. Theoretical modeling is also difficult because the geodynamo is essentially nonlinear. Here I propose a simple model that may explain how the geomagnetic field intensity is determined. The model consists of two processes; the alpha effect and the magnetic instability. The former creates an axisymmetric magnetic field (e.g., a magnetic dipole) through interaction of non-axisymmetric (higher order) magnetic fields and fluid flows. The latter creates non-axisymmetric magnetic field through natural instability of an axisymmetric (toroidal) magnetic field. The idea is that the magnetic energy spectrum is determined so as to balance the magnetic energy transports between the axisymmetric and non-axisymmetric parts. I report recent results on magnetic instability and discuss the critical toroidal-field intensity, the critical wavenumber, and linear growth rate that may be plausible in the Earth's core condition. I also discuss whether this simple model can explain Earth and planetary magnetic field intensity.