地磁気西方移動の起源

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Origin of geomagnetic westward drift

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The westward drift has been known as one of the most remarkable characteristics in geomagnetic secular variations. Observations indicate that the westward drift is clearly seen in lower latitudes under the Atlantic hemisphere and the drift velocity is of the order of 10 km/yr at the core surface (e.g., Finlay and Jackson, 2003). Recent high-resolution geodynamo simulations show that there are several strong magnetic-flux patches near the equator and they move westward because of the presence of a westward mean zonal flow near the core equator (Sakuraba and Roberts, 2009). In the last JpGU meeting, one of the authors showed preliminary results of Fourier analysis of the magnetic field data at the surface of the core produced by a numerical geodynamo model. Here we report some progress on the Fourier analysis and discuss the origin of the westward drift. The drift velocity in the numerical model approximately coincides with the zonal flow velocity near the core surface, but still depends on the azimuthal wavenumbers (m) of the magnetic field signals. Lower wavenumber components (m = 1, 2) show nearly rigid westward rotation and there is a weak but significant signal of eastward rotation too. Higher wavenumber components (3 < m < 6) have significant powers at low latitudes, and tend to follow the zonal flow velocity, indicating that advection plays a primary role in the magnetic-field time variations. Here we point out that suggestive information is given by a linear analysis of slow MC (magneto-Coriolis) waves confined in a rotating fluid sphere in the presence of background toroidal magnetic field and zonal flow. The results of linear wave analysis are given in the talk session of this conference, and we will discuss how the MC waves explain the westward (and eastward) drift in the numerical model and the geomagnetic field data.