Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SEM34-15 会場:102A 時間:5 月 24 日 15:15-15:30

コア表面流の沸き出し・沈み込みによる地磁気永年変化
Geomagnetic secular variation due to upwelling and downwelling flows at the core surface

松島 政貴 [1*]
MATSUSHIMA, Masaki[1*]

[1] 東京工業大学
[1]Tokyo Institute of Technology

Fluid flow near the core surface can be estimated from spatial distribution and secular variation of the geomagnetic field. We have developed a new approach into which the magnetic diffusion is incorporated inside the boundary layer at the core-mantle boundary (CMB), while it is neglected below the boundary layer as in the so-called frozen-flux approximation.

Locations of upwelling and downwelling flows can be derived from the core surface flow thus estimated, and the distribution inside and below the boundary layer provides information on existence of convective columns, which are classified into cyclonic and anti-cyclonic ones; an axial flow component from the CMB to the equator exists in a cyclonic column, whereas that from the equator to the CMB in an anti-cyclonic column. In reality, we have found typical distribution for convective columns in core surface flow below the Indian Ocean for the epoch of 1980.

In many numerical dynamo models, magnetic advection due to downwellings associated with cyclonic vortices is found to be in balance with magnetic diffusion, and cyclonic vortices at the core surface can be responsible for magnetic flux patches. Intense magnetic flux spots seen in equatorial regions might be generated by columnar flows near the equator. Hence we have examined secular variations due to upwelling and downwelling flows at the core surface. It turns out that intense flux spots in equatorial regions do not correspond to downwellings associated with axial flows in cyclonic columns near the equator. This result implies that pairs of intense magnetic flux spots in equatorial regions are produced by flux expulsion due to columnar flows there, and that magnetic diffusion is significant in equatorial regions.

キーワード: コア表面流, 永年変化, 地球磁場
Keywords: core surface flow, secular variation, geomagnetic field