

The estimation of spatial structures of magnetospheric plasma by using the data observed by LEO satellites.

*Yoshihiro Yokoyama¹, Toshihiko Iyemori², Tadashi Aoyama¹

1. Department of Earth and Planetary Sciences, Graduate School of Science, Kyoto University, 2. Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University

In the regions of high-beta plasma such as the plasma sheet or the boundary layer in the magnetosphere, it can be expected that the plasma behaves as turbulence due to the effects of various plasma instabilities, non-linear development of Alfvén waves, and so on. Satellites in the plasma sheet also have observed the fluctuations in velocity and magnetic field that have the characteristics of fluid turbulence (Borovsky et al. 1997). If the plasmas usually behave as turbulence, the spectrum and their distribution are important for understanding phenomena in the magnetosphere. However, it is almost impossible to have sufficient simultaneous satellite observations that cover the huge magnetospheric domain.

On the other hand, we confirmed that the magnetic fluctuations having period longer than 2s observed by low Earth orbit (LEO) satellites can be regarded as the manifestation of the spatial structure of the field-aligned currents by using the magnetic data obtained by Swarm satellites during December, 2013 when the satellites flew on nearly the same orbits with slight time separations. In addition, the LEO satellites fly through wide range of magnetic latitudes in a short period of time, so, by projecting their orbits into the magnetosphere, they can scan wide range on the equatorial plane of the magnetosphere. therefore, by projecting these fluctuations onto the equatorial plane of the magnetosphere, i.e., the source regions of field-aligned currents, we try to estimate the distribution of turbulent region and their characteristics there.

We made statical maps of the amplitude of magnetic fluctuations for both quiet ($AE < 50\text{nT}$) and disturbed ($AE > 50\text{nT}$) conditions. We also made spectral analysis of magnetic fluctuations by MEM and found that there are many peaks in wide frequency range in every spectrum regardless of the geomagnetic conditions, MLTs, and so on.

This result suggests that the magnetospheric plasmas usually behave as turbulence. In this paper, in addition to the result above, we also discuss the wave-number spectrum in the magnetosphere.

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