[초SE-01] Physics of the Earth's plasma sheet associated with substorm triggering

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The plasma sheet of the Earth's magnetosphere is a sheet of hot plasmas in the magnetotail region, dividing the two (northern and southern) lobes of the Earth's magnetic field. It is the key region that is often closely linked to various electromagnetic dynamics in the Earth's magnetosphere-ionosphere system. In particular, it is the region that is most crucial for substorms, which is one of the most dynamic phenomena in the Earth's magnetosphere. The question of substorm triggering remains highly controversial until today, and at the center of the controversy there are several critical physics issues of the plasma sheet. In this talk I will introduce some of the physics issues of the plasma sheet. The specific topics that this talk will cover are (i) the general properties of the plasma sheet, (ii) fast plasma jets and plasma transport problem, (iii) stability/instability problem, and (iv) effects of thin current sheet. I will also present some of our group's recent findings regarding these topics, as obtained by comprehensive analyses of various observational data. The level and content of this talk are designed to be comprehensible to not only space physicists but also the scientists in a related field such as solar and heliospheric physics.

[구SE-02] Test of magnetic turbulence anisotropy associated with magnetic dipolarizations

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The anisotropic nature of the magnetic turbulence associated with magnetic dipolarizations in the Earth's plasma sheet is examined. Specifically we determine the power spectral indices for the perpendicular and parallel components of the fluctuating magnetic field with respect to the background magnetic field and compare them to determine possible anisotropic features. For this study, we identify a total of 47 dipolarization events from February 2008 using the magnetic field observations by the THEMIS A, D and E satellites when they are situated closely near the neutral sheet in the near-Earth tail. For the identified events, we estimate the spectral indices for the frequency range from 1.3 mHz to 42 mHz. The results show that for many events the spectral indices are larger for fluctuations in the ψ direction than for those in the other two directions, where the ψ direction is perpendicular to the background magnetic field line and to the azimuthal direction. This implies that the dipolarization-associated turbulence of the magnetic field is often anisotropic. We discuss how this result differs from what is expected from the theory of homogeneous, anisotropic, MHD turbulence.