

高緯度Pc3波動のスペクトル解析

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Spectral Analysis of Pc 3 Pulsations in the Cusp Region

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Previous studies have shown that Pc 3 pulsations in the cusp regions exhibit peculiar characteristics in power and spectrum. The Pc 3 pulsations have a maximum in power at the cusp latitudes (Troitskaya, 1985), for example, and sharper spectral peaks there (Kato et al., 1985). More recently, an HF radar observation demonstrated that coherence length of the pulsations is very small (Baker et al., 1998). Although it is accepted that the solar wind provides the energy which produces the Pc 3 pulsations, how the energy enters the magnetosphere and appears as Pc 3 pulsations in the cusp region is not yet fully explained. In this paper, we address this subject by using data from SuperDARN HF radars and satellites. Particularly, the spatial structure of Pc 3 characteristics is investigated using a spectral analysis. The analyses show the following: (1) Power of Pc 3 pulsations in the Doppler velocity is maximum near the equatorward of a region of large width of the Doppler power spectrum and spectral peaks of the Pc 3 pulsations are quite sharp there. (2) The magnetic latitudes of power maximum change between 74-77 degree, and the time variation of the latitudes is similar to that of the IMF direction and the solar wind dynamic pressure. (3) Magnetic field fluctuations in the magnetosheath include spectral peaks identical to the Pc 3 pulsations, whereas the local time differences between the space and the ground are quite large. The result (1) is consistent with previous observations using magnetometer chains, although the power of the pulsations used in this analysis decays more steeply with latitudes. The result (2) is very interesting because the latitudes of power maximum are

controlled by the solar wind parameters such as the IMF direction and the solar wind dynamic pressure. Since the region of large spectral width is consistent with the cusp region (Baker et al., 1995), the latitudinal variation of Pc 3 power maximum would be due to the variation of the cusp latitudes. Finally, the result (3) gives us an important clue to the source of Pc 3 pulsations. One possibility is that compressional waves generated outside the magnetosphere cause modulations of particles precipitating along the cusp/LLBL field lines.