Analysis of Geosynchronous Magnetopause Crossings 4

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The location of the earth's magnetopause is at X = 10 Re on average at the subsolar point, and mainly controlled by the solar wind dynamic pressure (Pd) and southward IMF (Bz). Sometimes it moves earthward across the geosynchronous orbit when Pd is extremely enhanced or the erosion is highly developed due to the continuous intense southward IMF. These events are called Geosynchronous Magnetopause Crossings (GMCs).

Three authors studied GMCs statistically [Rufenach et al.,1989; McComas et al.,1994; Itoh,1997]. All of them focused a dawn-dusk asymmetry of the occurrence rate of the GMCs. Rufenach et al.[1989] analyzed 64 GMC events observed by GOES magnetometers, and mentioned that the local time distribution of the occurrence rate had dawn-dusk asymmetry. However McComas et al.[1994] analyzed the events observed by the magnetospheric plasma analyzer (MPA), and reported no significant dawn-dusk asymmetry in the occurrence rate except for the effect of the solar wind aberration. Itoh[1997] analyzed 206 events observed by GOES satellites and reported that the dawnward shift of the distributions were found in the case when the Dst index developed lower than -100nT.

To examine the dependence of the GMC occurrence on the solar wind conditions, we analyzed GOES magnetometer data from January 1996 to November 2001, and detected 102 intervals (29 days) of GMC events, and we checked the localtime distributions of the magnetosheath observations. The distribution of the all observation is a little shifted to the prenoon sector (its averaged localtime is about 12.0 h LT and its skewness is about -0.25). The dependence of the distributions on the intensity of the SYM index H component was checked. When the SYM-H is higher than -100 nT (case I), the averaged localtime for the distribution is about 12.0 h LT and skewness is -0.28. When the SYM-H is lower than -100 nT (case II), the averaged localtime is about 12.0 h LT and skewness is -0.24. From 8 to 10h LT, the distributions in the 2 cases are much different, a preference of the occurrence are found in the case II. These features are roughly consistent with the results by Itoh[1997]. Then we checked the solar wind conditions during the 70 intervals. In the case II, almost all the Pd were less than about 20 nPa and almost all the Bz were negative and mostly less than -15 nT. Here we discuss the geomagnetic responses observed at geosynchronous orbit and on the ground to the solar wind conditions during these events.