Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM005-35 会場:303 時間:5 月 27 日 15:55-16:10

Morning-afternoon asymmetry of geosynchronous magnetic field

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The present study examines the morning-afternoon asymmetry of the geosynchronous magnetic field strength on the dayside (MLT = 06-18 hours) using observations by the GOES satellites over a period of 9 years from February 1998 to January 2007. During geomagnetically quiet intervals (Kp < 3), we observed that a peak of the magnetic field strength is skewed toward the earlier local times (MLT = ˜11.1-11.6) with respect to local noon and that the geosynchronous field strength is larger in the morning sector than in the afternoon sector. That is, there is the morning-afternoon asymmetry of the geosynchronous magnetic field strength. We found that the peak location of the magnetic field strength is shifted toward the earlier local times as the ratio of the magnetic field strength at MLT = 18 (B-dusk) to the magnetic field strength at MLT = 06 (B-dawn) is decreasing. It is also found that the dusk to dawn B field ratio, B-dusk/B-dawn, is decreasing as increasing solar wind dynamic pressure. The morning-afternoon asymmetry of the magnetic field strength appears in Tsyganenko geomagnetic field model (TS-04 model) when the partial ring current is included in TS-04 model. Unlike our observations, however, TS-04 model shows that the peak location of the magnetic field strength is shifted toward the noon as the solar wind dynamic pressure grows in magnitude. This may be due to that the symmetric magnetic field associated with the magnetopause current, strongly affected by the solar wind dynamic pressure, increases. However, the partial ring current is not affected as much as the magnetopause current by the solar wind dynamic pressure in TS-04 model. Thus, our observations suggest that the contribution of the partial ring current at geosynchronous orbit is much larger than that expected from TS-04 model as the solar wind dynamic pressure increases.

キーワード: morning-afternoon asymmetry, geosynchronous magnetic field, partial ring current
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