■ Session : 우주환경 II
4월 30일(금) 13:30 - 15:30 제3발표장

[IV-3-1] 삼축 MI 자력계 설치 및 운용
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한국천문연구원 우주과학연구본부 태양우주환경연구그룹은 일본 Tierra Tecnica사의 RFP-523C Overhauser Proton 자력계와 MISYS-09 삼축 MI 자력계를 2009년 11월에 보현산천문대 태양망원경동에 구축하였다. 한국천문연구원은 이미 2007년 11월에 RFP-523C Fluxgate 자력계를 보현산천문대 태양망원경동에 구축하여 K 지수 산출 등의 우주환경예·경보 연구에 활용하고 있다. Fluxgate 자력계는 지자기 3축 성분의 변화량을 측정하는 장비이고 이번에 설치한 Overhauser Proton 자력계는 지자기의 총 자기장을 측정하는 장비이다. 삼축 MI 자력계는 지자기장의 wave를 측정하는 장비이다. 기존에 설치한 Fluxgate 자력계와 새로 설치한 Proton 자력계, 삼축 MI 자력계를 연계하여 운용할 경우 우주환경에 의한 지자기장 변화량의 측정 정밀도가 향상되고 지자기장을 효율적으로 관측할 수 있다. 보현산천문대에 구축한 각각의 자력계가 측정한 지자기 자료들은 S-FTP와 Socket 통신을 이용하여 대전에 있는 한국천문연구원 태양우주환경연구그룹의 데이터 서버로 실시간으로 전송되어 저장되고 있다. 데이터 서버로 전송된 지자기 측정 자료들은 한국천문연구원 우주환경감시실에서 모니터링하고 있다.

[IV-3-2] Morning-afternoon asymmetry of geosynchronous magnetic field variations during geomagnetic sudden commencements
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It has been reported that geosynchronous magnetopause crossings are more frequently observed in the prenoon sector than in the postnoon sector, indicating a dawn-dusk magnetopause asymmetry during extreme solar wind conditions. Motivated by these observations, we investigate geosynchronous magnetic field variations normalized to SYM-H when sudden commencements (SC) are observed on the ground. From a statistical analysis of the geosynchronous magnetic field responses to SC events from 1997 to 2006, we found that the normalized SC amplitude at geosynchronous orbit is larger in the morning sector than in the afternoon sector. In order to examine if this morning-afternoon asymmetry at geosynchronous orbit occurs only during disturbed geomagnetic conditions, we compared the geosynchronous magnetic field strength obtained in the morning and afternoon during undisturbed intervals (Kp < 3). We found that the asymmetry appears under undisturbed geomagnetic conditions and it is not due to solar wind aberration. This indicates that the morning-afternoon asymmetry was not strongly affected by changes in solar wind condition. Using solar wind data, we discuss what causes the morning-afternoon asymmetry at geosynchronous orbit.

[IV-3-3] THEMIS Pi2 observations near dawn and dusk sectors in the inner magnetosphere
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The most frequently suggested source for Pi2 pulsations in the inner magnetosphere (L < 4) is standing fast-mode waves trapped in the plasmasphere (i.e., plasmaspheric resonances). They have been considered as the source of low-latitude Pi2 pulsations. The plasmaspheric resonance model suggests that compressional fast-mode waves can be detected at all local times inside the plasmasphere provided reflection of the wave energy is efficient. Until now, however, there are no reports about compressional Pi2s observed in the dayside inner magnetosphere. That is, there is longitudinal limit of inner magnetosphere. In February 2008, THEMIS probes were near dawn and/or dusk sides, which are the transition regions between the nightside and dayside, in the inner magnetosphere (L = 2-4) when low-altitude Pi2s were identified at Bohyun (L = 1.35) station in Korea. Using the THEMIS electric field data, we examined if Pi2s are excited by longitudinally localized disturbances. We found that compressional Pi2s having high coherence with a low-latitude Pi2 pulsation occur on dawnside. However, any compressional pulsations in the Pi2 frequency band were not detected on duskside. This indicates that compressional Pi2s disappear near the duskside. Our observations are discussed with spatial plasmaspheric structure and possible Pi2 mechanisms.

[IV-3-4] Statistical properties of the fast flows accompanied by dipolarization in the near-Earth tail
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Using magnetic field and plasma moment data obtained by THEMIS satellites(A, D, and E), we selected 203 fast flow events accompanied by dipolarization in the near-Earth region(X(GSM) = -7 ~ -12 RE) and statistically examined

their properties. It was found that most of the fast flows show the maximum velocity between 1 minute before dipolarization onset and 2 minutes after onset and proceed earthward and duskward. We also found that only the flows with low velocity of less than 400 km/s are observed at X > -8 RE, while the high velocity flows(as well as low velocity flows) are observed at the further tailward region(X < -8 RE). And most of the tailward flows are slow regardless of distance at X(GSM) = -7 ~ -12 RE. On the other hand, if we consider the fast flow as a bubble (Pontius and Wolf, 1990), the entropy parameter, PV5/3 is an important factor to describe the plasma sheet dynamics. Thus we investigated the relationship between the flow velocity and the amount of change in PV5/3 before and after dipolarization onset and found out that the dipolarizations with more depleted entropy parameter tend to show higher flow velocity. Also we examined how the magnetic field at geosynchronous orbit responds to the fast flow accompanied by dipolarization in the near-earth plasma sheet, using the measurements from GOES 11 and 12 statellites. We found that most of the fast flows do not reach geosynchronous orbit as suggested by Ohtani et al. (2006).

[IV-3-5] Two-fluid model of the tangential plasmapause

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A bipolar magnetic field perturbation in the meridional plane was observed when the Polar spacecraft crossed the plasmapause near the midnight, which was identified by a clear jump in density and temperature, from the plasmasheet to the plasmasphere. The bipolar variation shows a negative-then-positive polarity. To examine the bipolar magnetic field perturbation at the plasmapause, we assume one-dimensional model with physical quantities varying along a direction normal to the plasmapause and employ two-fluid approach for the tangential plasmapause. That is, the magnetic fields on both sides are parallel. Considering Ampere's law and pressure balance relation, we have a perturbed magnetic field, which is consistent with the observation at the plasmapause.

[IV-3-6] 태양풍 동압력 증가에 의한 밤 지역 극관의 위도 상 위치 변화

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태양풍 동압력은 지구 자기장에 부딪히면서 많은 영향을 준다. 여기서 우리는 태양풍 동압력이 증가하는 경우 밤 지역 극관의 위도 상 위치 변화에 대해 관심이 있다. 동압력 증가 이전과 이후의 극관의 위치를 결정하기 위해 DMSP(Defense Meteorological Satellite Program) 위성이 관측한 하강 입자 자료를 사용하였고 이로부터 산출된 b5e parameter 값을 통해 극관의 위치를 결정하였다. 특히 IMF의 각 성분 별 방향과 크기에 대한 조건이 극관의 위치에 영향을 미친다는 점을 고려하여 분석하였다. 분석 결과를 통해 동압력이 증가하는 경우 극관의 위치가 고위도로 올라간다는 것을 확인하였다. 이는 극관의 크기가 수축한다는 것을 의미한다. 또한 IMF Bz가 북쪽 방향(northward IMF Bz)인 경우와 남쪽 방향(southward IMF Bz)인 경우에 따라 극관이 이동하는 정도에 약간의 차이가 있음을 알 수 있었다. 그런데 통계적으로 볼 때 극관의 위도상 위치가 상당히 분산되어 있음을 알게 되었다. 즉, 가능한 극관의 위도 분포가 매우 넓은 영역에 걸쳐 있음을 말한다. 이러한 분산 현상은 극관의 위치를 결정하는데 여러 이유가 복합적으로 작용 할 수 있음을 시사한다.