plasmapause. The ionospheric disturbances in the total electron content (TEC) maps shows that the steep TEC gradient is formed at the boundary of the positive ionospheric storm in low-middle latitudes and the negative ionospheric storm in middle-high latitudes. We interpret that the thermospheric neutral composition disturbance in the dayside is confined within the middle-high latitude ionospheric convection zone. The neutral composition latitudes and, therefore, the locations of the steep plasma density gradient coincide with the footprints of the plasmapause. The TEC maps show that the appearance of the steep plasma density gradient in the pre-midnight sector during the recovery phase is related to the co-rotation of the gradient that is created during the main phase.

[IV-1-2] Long-term variation of total electron contents over Daejeon measured from Global Positioning System between 2000 and 2010

Chi-Na Lee and Jong-Kyun Chung
Korea Astronomy and Space Science Institute, Korea

This study is about the ionospheric variation on the Korean Peninsula using GPS TEC data from Daejeon IGS GPS site. It has accumulated the 11 years GPS data from 2000. In this work, the hourly and daily averaged TEC data are used. Data period covers a full solar cycle from 2000 to 2010 (11 years) which the total observed days are 98%. The mean TEC data shows the annual/semiannual variation, solar cycle and 27 days. GPS TEC has a good correlation with solar F10.7 index. We also compare with planetary Kp and AE indices. The maximum of the daily mean GPS TEC is around 50 TECU at 2000 and that value of 2009 is near 10 TECU. we confirms that the GPS TEC is a good indicator for ionospheric variation for the mid-latitudinal region to understand the ionospheric climatology over Korea Peninsula.

[IV-1-3] GPS TEC Responses to Solar Flare Eruption and Geomagnetic Storm in 2011

Jong-Kyun Chung and Chi-Na Lee
Korea Astronomy and Space Science Institute, Korea

The Total Electron Content (TEC) measured from Global Positioning System (GPS) can be continuously or peculiarly increased (positive ionospheric storm) or decreased (negative ionospheric storm) with solar and geomagnetic activities as well as the chemical and dynamic processes with thermosphere in the mid-latitudes. The ionospheric storm is not easy to predict owing to its difficult mechanism, and the real-time GPS TEC monitoring may be useful to follow ionospheric response to solar and geomagnetic storms. Korea Astronomy & Space Science Institute has continuously monitor GPS TEC over Korea Peninsula in near real-time of 10 minutes to watch ionospheric immediate responses to solar and geomagnetic activities. In this presentation, we will report the variation of GPS TEC over Daejeon and JeJu in Korea during the period of solar flare eruption and geomagnetic storm events in 2011. These events in 2011 will be compared with the event in October 2003 and November 2004.

[IV-1-4] Comparison between Ionospheric and plasmaspheric TECs measured from JASON satellite: plasmaspheric flux

Han-Byul Lee[1,2], Geonhwa Jee[1], Yong Ha Kim[2], and Jong-Kyun Chung[3]
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The plasmasphere is filled with the ions and electron transported mostly from the mid-latitude ionosphere. In the topside ionosphere where the O^+ ions are still major ions, the O^+ ions are in chemical equilibrium with the H^+ ions and exchange their charges with each other's parent atoms with similar rates in both reactions. During the day, the newly produced H^+ ions flow upward to fill the plasmasphere while they flow downward and contribute to the maintenance of the ionospheric density at night under the geomagnetically quiet condition. The ionosphere and plasmasphere are coupled by these plasma fluxes and therefore strongly affect each other. In order to study these coupling we utilized the plasma density measurements from JASON satellite. This satellite measures vertical total electron content (TEC) from the ground to the satellite orbit (about 1336 km) and slant TEC from the satellite orbit to much higher GPS satellites by using the on-board dual-frequency altimeter and GPS receiver, respectively. The former measurement can represent the ionospheric TEC while the latter can represent the plasmaspheric TEC in the equatorial region. We compared these data with different seasons, solar activities and local times, and the results will be presented.

■ Session : 초청강연 II
4월 29일(금) 10:40 - 11:20 제1발표장

[IS-02] 거대망원경 시대와 한국 광학천문학의 미래 전망

박병곤
한국천문연구원

GMT 거대망원경 개발사업 참여를 계기로 한국의 광학천문학은 비약적인 발전의 계기를 맞게 되었다. 거대망원경의 개발을 위한 첨단 광학 및 광기계 기술 확보와 더불어 이 망원경을 이용한 세계적인 연구 성과의 창출이 가능해질 전망이다. 2011년 현재 세계적으로 진행되고 있는 GMT, TMT, E-ELT 등 세 개의 거대망원경 개발사업은 2020년대 초반이면 완료될 전망이다. 이 발

표에서는 거대 망원경 가동이 가동되기까지의 세계 천문학계 연구 동향과 거대망원경 시대의 전망을 조망함으로써 우리나라 광학천문학 분야의 중기 및 장기적 미래 전망에 대하여 고찰한다.

■ Session : 우주환경 Ⅰ
4월 29일(금) 13:00 - 14:00 제1발표장

[Ⅴ-1-1] Focal Plane Damage Analysis by the Space Radiation Environment in Aura Satellite Orbit

Dai Ho Ko[1], Jeoung Heum Yeon[1], Seonghui Kim[1], Sang Soon Yong[1], Seunghoon Lee[1], Enu Sup Sim[1], Cheol Woo Lee[2], Johan de Vries[3]

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Radiation-induced displacement damage which has caused the increase of the dark current in the focal plane adopted in the Ozone Monitoring Instrument (OMI) was studied in regards of the primary protons and the secondaries generated by the protons in the orbit. By using the Monte Carlo N-Particle Transport Code System (MCNPX) version 2.4.0 along with the Stopping and Range of Ions in Matter version 2010 (SRIM2010), effects of the primary protons as well as secondary particles including neutron, electron, and photon were investigated. After their doses and fluxes that reached onto the charge-coupled device (CCD) were examined, displacement damage induced by major sources was presented.

[Ⅴ-1-2] Comparison of CME radial velocities from the flux rope model and the ice cream cone model

Tae-Hyeon Kim, Yong-Jae Moon, Hyeon-Ok Na

School of Space Research, KyungHee University, Korea

Coronal Mass Ejections (CMEs) are enormous eruptions of plasma ejected from the Sun into interplanetary space, and mainly responsible for geomagnetic storms and solar energetic particle events. It is very important to infer their direction of propagation, speed and their 3-dimensional configurations in terms of space weather forecast. Two STEREO satellites provide us with 3-dimensional stereoscopic measurements. Using the STEREO observations, we can determine the 3-dimensional structure and radial velocity of the CME. In this study, we applied three different methods to the 2008 April 26 event: (1) Ice cream Cone Model by Xue (2005) using the SOHO/LASCO data, (2) Flux rope model by Thernisien (2009) using the STEREO/SECCHI data, (3) Flux rope model with zero angle using the STEREO/SECCHI data. The last method in which separation angle of flux rope is zero, is similar to the ice cream cone model morphologically. The comparison shows that the radial speeds from three methods are estimated to be about 750km/s and are within ±120km/s. We will extend this comparison to other CMEs observed by STEREO and SOHO/LASCO.

[Ⅴ-1-3] Comparison to Cone Models for Halo Coronal Mass Ejections

HyeonOck Na, Yong-Jae Moon

School of Space Research, KyungHee University, Korea

Halo coronal mass ejections (HCMEs) are mainly responsible for the most severe geomagnetic storms. To minimize the projection effect of the HCMEs observed by coronagraphs, several cone models have been suggested. These models allow us to determine the geometrical and kinematic parameters of HCMEs : radial speed, source location, angular width, and the angle between the central axis of the cone and the plane of the sky. In this study, we compare these parameters form two representative cone models (the ice-cream cone model and the asymmetric cone model) using well-observed HCMEs from 2001 to 2002. And we obtain the root mean square error (rms error) between observed projection speeds and calculated projection speeds for both cone models. It is found that the average rms speed error (89 km/s) of the asymmetric cone model is a little smaller than that (107 km/s) of the ice-cream cone models, implying that the radial speeds from both models are reasonably estimated. We also find that the radial speeds obtained from two models are similar to each other with the correlation coefficient of about 0.8.

■ Session : 우주환경 Ⅱ
4월 29일(금) 14:10 - 15:30 제1발표장

[Ⅵ-1-1] The Probability of Solar Proton Events (SPEs) depending on solar and interplanetary type Ⅱ bursts

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Solar Proton Events (SPEs, ≥ 10 $cm^{-1}s^{-1}sr^{-1}$ with >10 MeV) are very important for space weather forecasting. It is well known that they are associated with solar flares and/or CME-driven shocks. Especially, the CME-driven shocks have been observed as solar and interplanetary type II bursts. In this study, we estimated the occurrence probability of SPEs depending on three groups: (1) metric, (2) decameter-hectometric (D-H), and (3) meter-to-kilometric (m-to-km) type II bursts. For this work, we used SPEs and all available type II burst data in 1996-2004. The primary findings of this study are as follows. First, the majority (77%) of the m-to-km type II bursts are associated with SPEs and its probability is noticeably higher than D-H type II bursts