[III-1-3] Relationship between Coronal Mass Ejections Eccentricity parameter and the strength of geomagnetic storm

Rho, Su-Lyun[1], Chang, Heon-Young[1], and Moon, Yong-Jae[2]

[1]Department of Astronomy and Atmospheric Sciences, College of Natural Sciences, Kyungpook National University, [2]Department of Astronomy and Space science, Kyunghee University

We examine the eccentricity parameter (EP) of Coronal Mass Ejections (CMEs). For this, we select 298 front-side CMEs from SOHO LASCO CMEs whose speed is larger than 1000km/s and angular width is greater than 120° during from 1997 to 2007. These are thought to be the most plausible candidate of geoeffective CMEs. We examine the relation between CMEs eccentricity parameter and the minimum value of the Dst index. We find that strong geomagnetic storms (Dst < -200nT) are well correlated with the EP from the scattered plot. We also find that CMEs have high geoeffectiveness when they occurred near the center of the solar disk with the small EP and they have the small speed with the small EP. These results indicate that the CME EP also can be an important indicator to forecast CME geoeffectiveness such as Earthward direction parameter (Moon et al. 2005, Kim et al. 2008).

[III-1-4] Correlation Analysis between Global Warming Index and Its Two Main Causes (space weather and green house effects) from 1868 to 2005

Yong-Jae Moon

Kyunghee University

We have examined the relative contributions of representative space weather proxies (geomagnetic aa index) to global warming (Global temperature anomaly) and compared them with that of green house effect characterized CO2 content from 1868 to 2005. For this we used Hadcrut3 temperature anomaly (Ta) data, aa index taken at two anti-podal subauroral stations (Canberra Australia and hartland England), and the CO2 data come from historical ice core records. From the comparison between Ta and aa index, we found several interesting results: (1) the linear correlation coefficient between two parameters increases until 1990 and then decreases rapidly, and (2) the scattered plots between two parameters shows different patterns before and after 1990. A partial correlation of Ta and two quantities (aa, CO2) also shows that the geomagnetic effect (aa index) is dominant until about 1990 and the CO2 effect becomes much more important after then. These results imply that the green house effect become very important since at least 1990. For a further analysis, we simply assume that Ta (total) = Ta (aa) + Ta (CO2) and made a linear regression between Ta and aa index from 1868 to 1990. A linear model is then made from the linear regression between energy consumption (a proxy of CO2 effect) and Ta (total) - Ta (aa) since 1990. This linear model makes it possible to predict the temperature anomaly in 2030, about 1 degree higher than the present temperature, which is much larger than in the previous century.

■ Session IV-1 : Upper Atmosphere
Wednesday, 22 October [17:40-18:40]

[IV-1-1] The height variation of F2 peak density using Anyang Ionosonde measurements for GNSS ionospheric model

Eojin Kim[1], Jong-Kyun Chung[2], Yong Ha Kim[1], and Jungho Cho[2]

[1]Department of Astronomy and Space Science, Chungnam National University, Korea, 2Korea Astronomy and Space Science Institute, Korea

The signals transmitted from satellites of Global Navigation Satellite System (GNSS) interact with the plasma of the ionosphere. To study the impact of the ionospheric plasma on GNSS applications a comprehensive knowledge of the ionosphere is required. Especially the correct measurement of the ionosphere such as the peak height of the F2 layer peak electron density (hmF2) is important for the GNSS ionospheric model. Anyang ionosonde station (37.39°N, 126.95°E) has been operating from October 2000 and the accumulated data for 8 years may allow us to obtain climatological characteristics of middle latitude ionospheric F region for GNSS application. We analyzed the variations of the hmF2 and NmF2 over Anyang station for different conditions of solar activity, geomagnetic activity, season, and local time, and we compared our results with the IRI model.

[IV-1-2] Vertical emission rate variations of the O2 (0-0) Atmospheric band from TIMED Doppler Interferometer (TIDI)

Jong-Kyun Chung[1] and Qian Wu[2]

[1]EOS Research Group Korea Astronomy & Space Science Institute, Korea

[2]High Altitude Observatory, National Center for Atmospheric Research, USA

Limb scanning measurements of the O2 (0-0) Atmospheric band emission by the TIDI instrument aboard the TIMED

satellite during 2003-2005 are analyzed to examine the tidal effects on their vertical emission rate according to the solar and geomagnetic activities. The data are restricted at latitudes 60°S - 60°N to avoid the contributions by the auroral emission. The variation of the vertical emission rate in latitude and local time is summarized in the yaw periods. The vertical emission profiles of the O2 (0-0) Atmospheric band nightglow averaged in the 10° latitude range are investigated. The result shows the inverse relationship between the peak emission height and the integrated brightness.

[IV-1-3] Seasonal and solar activity variations of the Weddell Sea Anomaly observed in the TOPEX TEC measurements

Geonhwa Jee[1], Alan G. Burns[2], Yong-Ha Kim[3], and Wenbin Wang[2]

[1]Korea Polar Research Institute, KORDI
[2]National Center for Atmospheric Research
[3]Chungnam National University

The Weddell Sea Anomaly (WSA) in the ionosphere is characterized by higher plasma density at night than during the day in the region near the Weddell Sea. According to previous studies on the WSA, it is known to occur mostly in southern summer and has not been reported in other seasons. We have utilized more than 13-year TOPEX TEC measurements in order to study how the WSA varies with seasons and how it changes with solar activity. The TOPEX TEC data have been extensively utilized for the climatological study of the ionosphere due to its excellent spatial and temporal coverage. We investigate the seasonal and solar activity variations of the WSA using four seasonal cases (Mar. equinox, Jun. solstice, Sep, equinox, and Dec. solstice) and two solar activity conditions (F10.7<120 for solar minimum and F10.7>120 for solar maximum conditions) for geomagnetically quiet periods. Our analysis shows that the WSA occurs only in the southern summer hemisphere for low F10.7, as in previous studies, but the WSA occurs all of seasons except for winter when F10.7 is high: it is most prominent during the December solstice (southern summer) and still strong during both equinoxes. The WSA appears to be an extreme case of global longitudinal variations at mid- and high-latitudes.

[IV-1-4] Polar rain flux variations in northern hemisphere observed by STSAT_1 with IMF geometry.

Jinhy Hong[1], J.-J Lee[2], K.-W Min[1], and K.-H Kim[2]

[1]Department of Physics, KAIST (Korea Advanced Institute of Science and Technology), Daejeon, South Korea
[2]KASI (Korea Astronomy and Space Science Institute), Daejeon, South Korea

Polar rain is a spatially uniform precipitation of electrons with energies around 100eV that penetrate into the polar cap region where geomagnetic field lines are connected to the Interplanetary Magnetic Fields (IMF). Since their occurrences depend on the IMF sector polarity, they are believed to originate from the field aligned component of the solar wind. However, statistically direct correlation between polar rain and solar wind has not been shown. In this presentation, we examined specifically the IMF strength influence on the polar rain flux variation by classifying of IMF sector polarities. For this study, we employed the polar rain flux data measured by STSAT-1 and compared them with the solar wind parameters obtained from the WIND and ACE satellites. We found the direct mutuality between polar rain flux and IMF strength with correlation coefficient above 0.5. This proportional tendency appears stronger when the northern hemisphere is in the away sector of the IMF, which could be associated with a favorable geometry for magnetic reconnection. Simple particle trajectory simulation clearly shows why polar rain intensity depends on the IMF sector polarity. These results are consistent with the direct entry model of Fairfield et al.(1985), while low correlation coefficient with solar wind density, the similarity between slops of both energy spectra shows that transport process occur without acceleration.

■ Session II-2 : Orbit 1
Wednesday, 22 October [14:20-15:35]

[II-2-1] Multiple revolution Lunar Trajectory Design using Impulsive Thrust

Hye Young Kang[1], Young-Joo Song[1], Sang-Young Park[1], Kyu-Hong Choi[1], and Eun-Sup Sim[2]

[1]Astrodynamics & Control Lab, Department of Astronomy, Yonsei University, Seoul 120-749, Korea
[2]Korea Aerospace Research Institute, Deajeon 305-333, Korea

The direct way to the moon is to start from the parking orbit by using impulsive thruster In previous domestic research, the direct way has been studied by using a single impulsive shot. However, when a single impulsive shot occurs to go into a Translunar orbit, gravity losses occur because thruster is not impulsive shot but the finite burns and it causes the gravity losses. To make up for the weak point of a single impulsive shot, this paper divides TLI (Trans Lunar Injection) into several small burns. Therefore,