[EE] Evening Poster | P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM12]Space Weather, Space Climate, and VarSITI

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Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

Past, Present, and Future of Solar-Terrestrial Environment is the keynote of this session. We share the latest scientific papers to understand how the solar-terrestrial environment changes in various time scales, and discuss the necessary international collaboration projects associated with VarSITI. More specifically, welcomed papers include space climate studies using tree rings and ice cores; cutting-edge observational and modeling studies of geospace, heliosphere and the sun; simulation and statistical studies to predict the future space weather and space climate.

[PEM12-P05]Long-term variation in the latitudinal distribution of the mid- and low-latitude coronal holes

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Corotating interaction regions (CIRs) are produced by interaction between low- and high-speed solar winds. The high-speed solar wind originates from coronal holes (CH) and causes a major disturbance of the Earth’s magnetosphere. CH is frequently observed in a declining phase of the solar cycle and have open magnetic fields expanding to the interplanetary space. Tsurutani et al. [2006] proposed that analyses of the temporal area of polar CH over the solar cycle [Harvey et al., 2000; Harvey and Recely, 2002] provide a good idea of the geoeffectiveness of high speed solar wind over the solar cycle. However, an effect of isolated equatorial CH has yet to be evaluated. In this study, in order to clarify the effect of the Earth's magnetosphere and ionosphere associated with the high-speed solar wind originating from the equatorial CH, we conducted a superposed epoch analysis of the variations of CH area, solar wind, interplanetary magnetic field (IMF), and geomagnetic indices (AL, AU, and SYM-H). The geomagnetic indices are provided by World Data Center for Geomagnetism, Kyoto University. In the present analysis, we used the Sun whole two-dimension images taken by the Extreme ultraviolet Imaging Telescope (EIT) onboard the Solar and Heliospheric Observatory (SOHO) and Atmospheric Imaging Assembly (AIA) on board the Solar Dynamics Observatory (SDO). For analysis of solar wind and IMF, we referred to the OMNI2 data provided by NASA CDAWeb. Their data availability period is from May 1996 to December 2016. For the CH areas, we defined a threshold of the solar brightness in an extreme ultraviolet (EUV) range as a half of the median value of the intensity in a whole area and divided the solar surface in four regions: (-60 - -30, -30 - 30), (-30 - 0, -30 - 30), (0 - 30, -30 - 30), and (30 - 60, -30 - 30) (degrees) in the solar latitude and longitude, respectively. Finally, we determined the CH area as a ratio of pixel numbers less than the threshold to each region. As a result, we statistically show a north-south asymmetry in the CH areas, which shows that the CH area is much larger in the southern hemisphere than in the northern hemisphere from 2000 to 2003. The temporal variation of the CH area is the largest in the low-latitude to equatorial regions (-30 - 0) degrees during the data period. As a next step, we analyzed the latitude-time distribution of the CH in order to investigate the temporal and spatial variations of CH with 1-month and 5-degree spatial resolutions in detail. As a result, the CH distributes in the low-latitude region of less than 40 degrees during 2000 – 2004 and in the middlelatitude region of more than 40 degrees during 1996 – 2000 and 2004 – 2008, respectively. Furthermore, the location of the CH shows periodic variations from low-latitude toward high-latitude during 2000 – 2004 and the apparent speed is 18 - 25 m/s in the northern hemisphere and 20 – 21 m/s in the southern hemisphere, respectively. This is similar to the speed of solar meridional flow. Therefore, this result suggests that the variation of weak magnetic field of the CH affects the meridional circulation.