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

PEM005-P01 Room:Convention Hall Time:May 26 10:30-13:00

Geomagnetic sudden commencement(SC) seen from the solar wind

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It is well known that geomagnetic sudden commencements (SCs) are caused by dynamic pressure(Pd) increase associated with interplanetary shock/discontinuities(IPS/DISCONs). It has not been known yet, however, if all of IPS/DISCONs produce SCs. There is no analysis which studied statistically ground geomagnetic signatures starting from the list of IPS/DISCONs. Here we first list up interplanetary IPS/DISCONs and then inveswtigate corresponding geomagnetic ground respnces.

Takeuchi et al. [2002] found that two IPSs with similar Pd increase produce different type of geomagnetic variations and that it depends upon differnece in inclination of the shock front. When the inclination is large, interaction time of the shock with the magnetosphere becomes longer and the shock produces a slower geomagnetic variation which is not identified as SC.

We first check if this is applied to other many IPS/DISCONs.

Keywords: Geomagnetic sudden commkencement (SC), solar wind, interplqanetary shock/discontinuity, magnetosphere, ionosphere

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Analysis of real-time magnetosphere simulation data using location of magnetopause

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It is possible to study responses of magnetosphere to various solar wind conditions using the large data set of the real-time magnetosphere simulation, which runs routinely in the National Institute of Information and Communications Technology (NICT).

There are several previous works using the data of the real-time simulation such as comparison between observed and calculated AE-index (Kitamura et al., 2008), analysis of geomagnetic fields at geostational orbit (Watari et al, 2010 SGEPSS meeting), and so on.

Here, we analyzed location of magnetopause obtained by the result of the real-time magnetosphere simulation. There is an empirical model called the Shue model on the location of magnetopause. This model takes account of dynamic pressure and south-ward IMF of solar wind. Locations of magnetopause obtained by the result of the real-time simulation were compared with those calculated using the Shue model. It is found that magnetopause location obtained by the simulation shows good agreement with that calculated by the Shue model.

Keywords: magnetopause, magnetosphere, simulation

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Global ionospheric currents driven by storm-time electric fields

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During the strong southward interplanetary magnetic field (IMF), the convection electric field originating from the region-1 field-aligned currents (R1 FACs) causes a two-cell ionospheric current at high latitudes [Nishida, 1968]. The convection electric field penetrates to the magnetic equator, and drives the eastward equatorial electrojet (EEJ) [Kikuchi et al., 1996]. This condition is called an undershielding. Subsequently, when the southward IMF weakens, the reversed ionospheric current, equatorial counter electrojet (CEJ), is driven by the developed shielding electric field originating from the region-2 field-aligned currents (R2 FACs). Its condition is called an overshielding because the shielding electric field relatively overcomes the reduced convection field in lower latitudes of the R2 FACs [e.g., Kelley et al., 1979]. However, the temporal and spatial development of global ionospheric current has not been yet established in middle latitudes during storms. So, we have investigated global ionospheric current deduced by magnetic field variations in high-low latitudes in the 21 storm events. During the periods of EEJ, the influence of the Hall current expanded into the middle latitudes (around 40 degrees in corrected geomagnetic latitude) driven by the intensified convection electric field. While, during the periods of CEJ, the reversed Hall currents appeared in the middle latitudes due to the overshielding electric field. Based on the above results, we reconstructed a picture of the 3-D current system depending on undershielding/overshielding condition corresponding to the storm main/early recovery phase, including the middle latitudes. Moreover, it is found the observed life time of CEJ was longer than that of the overshielding current at the middle latitudes. This fact implies that the CEJ at the equator is driven by the ionospheric disturbance dynamo. We will talk about global ionospheric currents driven by the convection, shielding, and disturbance dynamo electric fields.

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Space Weather: The International Journal of Research and Applications

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Since the era of development of the initial electrical telegraph systems in the early 19th century, the solar-terrestrial environment has influenced the design and operations of ever-increasing and sophisticated technical systems. James Van Allen reported in 1958 that the space environment around the Earth was not benign, but rather composed of high-intensity radiation. Engineers and scientists immediately recognized from this discovery that technical systems such as the communications satellites envisioned by Arthur Clark and John Pierce would require design and operations procedures (and therefore costs) that had not been otherwise anticipated. Space Weather: The International Journal of Research and Applications is an online publication devoted to the emerging field of space weather and its impact on technical systems, including telecommunications, electric power, and satellite navigation. The journal publishes (a) peer-reviewed articles presenting the latest engineering and science research in the field, including studies of the response of technical systems to specific space weather events, predictions of detrimental space weather impacts, and effects of natural radiation on aerospace systems; (b) news and feature articles providing up-to-date coverage of government agency initiatives worldwide and space weather activities of the commercial sector; (c) letters and opinion articles offering an exchange of ideas; and (d) editorial comments on current issues facing the community. The journal is published by the American Geophysical Union (AGU).

Keywords: Space weather impacts, Applications, Predictions