R006-01
Zoom meeting B ：11/1　AM1　(9:00-10:30)
09:00-09:15

SC の PI 期に現れる 2 つの電流系について

#藤田　茂 [1)2)]
気象大,[2)]極地研

Two current systems in the PI phase of the Sudden Commencement

#Shigeru Fujita[1),2)]
Meteorological College,[2)]National Institute of Polar Research

In the Preliminary Impulse (PI) phase of the Sudden Commencement (SC), the dayside magnetopause is suddenly compressed. Then, the induced magnetosonic wave propagates in the magnetosphere around the Earth. The field-perpendicular current flowing along the wavefront of the magnetosonic wave is converted into the field-aligned current in the inner magnetosphere. This field-aligned current reaches the ionosphere. Thus, the upward field-aligned current on the prenoon side, the perpendicular current of the magnetosonic wavefront in the magnetosphere, and the downward field-aligned current on the post noon side form a PI-phase current circuit [Araki, 1994; Fujita et al., 2003a]. The PI signal in the magnetosphere propagates at the speed of the magnetosonic speed.　This fast propagation of the SC signal is detected by the satellite observation [Takahashi et al., 2017].
Besides, the ground network observation indicates that the duration of the PI magnetic signal on the ground is longer in the higher latitude [Araki, 1992].　This feature is also confirmed by the simulation [Fujita et al., 2003a].　It seems hard to explain this feature by the scenario of the magnetosonic wave propagation described above.　Thus, we intend to reveal this feature based on the MHD simulation study.
In order to determine the PI current system from the simulation results, the current system from the point with the strongest PI field-aligned current in the ionosphere is usually selected as the starting point. This time, we select the high latitude area and the low latitude area where the PI current system is relatively strong, and the current line was traced starting from that location. As a result, the field-aligned current from the high latitude region is a current system consisting of the perpendicular current that connects the field-aligned currents in the prenoon and postnoon. While the current system from the low latitude region crosses the magnetopause. This current is connected to the magnetosheath current in the region where the magnetosheath is strongly deformed by solar wind shock passing through it. This PI current system was first discovered this time.
Further results will be open in the talk.
Araki, T., H. Shimazu, T. Kamei, and H. Hanado, Scandinavian IMS magnetometer array data and their use for studies of geomagnetic rapid variations. Proc. NIPR Symp. Upper Atmos. Phys., 5, 10-20, 1992.
Araki, T., A physical model of the geomagnetic sudden commencement. In Solar Wind Sources of Magnetospheric Ultra-Low-Frequency Waves, ed. by M. J. Engebretson, K. Takahashi, and M. Scholer, American Geophysical Union, Washington, D.C., 183-200, 1994.
Fujita, S., T. Tanaka, T. Kikuchi, K. Fujimoto, K. Hosokawa, and M. Itonaga (2003a), A numerical simulation of the geomagnetic sudden commencement: 1. Generation of the field-aligned current associated with the preliminary impulse, J. Geophys. Res., 108(A12), 1416, doi:10.1029/2002JA009407.
Takahashi, N., Y. Kasaba, Y. Nishimura, A. Shinbori, T. Kikuchi, T. Hori, Y. Ebihara, and N. Nishitani (2017), Propagation and evolution of electric fields associated with solar wind pressure pulses based on spacecraft and ground-based observations, J. Geophys. Res. Space Physics, 122, 8446-8461, doi:10.1002/2017JA023990.