Statistical characteristics of interplanetary magnetic field near the Earth

*Kyung-Eun Choi[1], Dae-Young Lee[1], Kyu-Cheol Choi[2], Jaehun Kim[3]

1. Chungbuk National University, Department of Astronomy and Space Science, Cheongju, Chungbuk, Korea , 2. Research Institute, SELab, Inc., Korea , 3. Korean Space Weather Center, National Radio Research Agency, Korea

Space weather creates geomagnetic disturbances that can impact our life. There are many reasons that cause space weather changes, and the interplanetary magnetic field (IMF) is the most important one. Compared with other components, IMF Bz is an immediate cause as it is a parallel component to the geomagnetic field. Intense geomagnetic disturbance can be made by magnetic reconnection which can occur more strongly when the magnitude of southward IMF Bz is stronger. Nevertheless, until to date, it has not been trivial to predict IMF Bz. In this work we analyze the statistical properties of IMF Bz measured at L1 point using the data from 1996 to 2015 corresponding to a solar cycle and a half. In this study, we classify the IMF data into three groups. They are IMF conditions associated with CME, those with CIR+HSS (high-speed stream) and the remaining ordinary conditions. We find that a majority (84%) of the IMF data are during the ordinary conditions, only 5% are related to CME structure and ~11 % are associated with CIR+HSS. In order to study geoeffectiveness, we have examined relativistic electron (>2MeV) flux response at geosynchronous orbit and compared them among the three groups. We have also investigated AL index. We find that the geomagnetic response in terms of AL and geosynchronous electron flux is non-negligible during the ordinary solar wind condition intervals compared to those of CME and CIR+HSS. In addition, we examine the correlations of IMF Bz with various solar wind parameters to determine the most responsible factors for southward IMF Bz.

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