Effect of expansion and magnetic field rotation of interplanetary flux rope on geomagnetic disturbance

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We examined effect of expansion of magnetic cloud on geomagnetic disturbance (Dst). In the self-similar expansion flux rope model of magnetic cloud (Farrugia et al.,1992 ; 1993, Marubashi, 1997), solar wind magnetic field and velocity are parameters to determine the structure of the flux rope. In the period of magnetic cloud, the characteristics, such as asymmetry peak of magnetic field magnitude, asymmetry of magnetic field rotation, and velocity declining toward the rear are explained by the expansion of interplanetary flux rope. These characteristics are expected to effect on Dst. In order to examine the effect of the Bz and the velocity on Dst, we calculated Dst from these solar wind parameters using the formula provided by Burton et al. (1975), Fenrich and Luhmann (1998) and O'Brien and McPherron (2000). The Dst using the observed Bz was compared with the Dst which is obtained when the observed Bz was reversed.

From this study, we obtained the result that for the expansion magnetic cloud, the magnitude of Dst can be different depending on the rotation of Bz field from S to N or N to S, since the magnitudes of Bz and velocity are different before and behind the magnetic field polarity change.