Indices for Forecasting Severe Space Weather

Nanan BALAN[1#+], Yusuke EBIHARA[2], R. SKOUG[3], Yoshiharu OMURA[2], Inez BATISTA[1], Takuji NAKAMURA[4]

[1] *National Institute for Space Research, Brazil*, [2] *Kyoto University, Japan*, [3] *Los Alamos National Laboratory, United States*, [4]*National Institute of Polar Research, Japan*
[#]*Corresponding author: balannanan@gmail.com* [+]*Presenter*

We suggest indices for forecasting severe space weather (SvSW) at the Earth that can damage technological systems such as electric power grids for the first time using ACE and IMP satellite data and Dst index. We study the characteristics of the CMEs that produced all 90 intense geomagnetic storms (DstMin < -100 nT) including 2 SvSW events since 1998 and earlier SvSW events such as the Carrington event of 1859, Quebec event of 1989 and an event in 1958. The CME and IMF parameters corresponding to the main phase (MP) of the geomagnetic storms are used to develop a forecast scheme. The scheme is tested using hourly values of solar wind and IMF. The results reveal that (1) all known electric power outages happened during the SvSW events that produced extreme geomagnetic storms having high mean Dst during MP (*mean Dst_{MP} < -250 nT*). (2) The products *(ΔV x Bz)*, (*V x Bz*) and (*P x Bz*) show very large negative values at the CME fronts (of velocity *ΔV*) that caused SvSW, with V, P and Bz being the solar wind velocity in km s^{-1}, dynamic pressure in nPa and north-south (northward positive) component of IMF in nT. (3) The product *(ΔV x Bz)* seems a suitable index for forecasting SvSW.