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TRANSIENT PLASMA SIGNATURES AND SPACE WEATHER

Abstract

One of the prime challenges for space weather researchers today is to quantitatively predict the dynamics of the geo-magnetosphere from measured solar wind and interplanetary magnetic field (IMF) conditions. In the present study a correlative study between geomagnetic storms and the various interplanetary (IP) field / plasma parameters have been performed to search the perpetrators of geomagnetic activity and to develop such model suitable for predicting the occurrence of geomagnetic storms, which are significant for space weather predictions. We investigated a possible relationship between geomagnetic storms and solar wind and IMF parameters in different situations and also derived the linear relationship for all parameters in different situations based on the peak values of Disturbance storm time index (Dst). The investigation is performed utilizing the fact that the total interplanetary magnetic field (IMF Btotal) can be used to trigger an intense geomagnetic storms well represented by the Dst index. Our results inferred that the southward Bz component of the interplanetary magnetic field is an important factor for describing geomagnetic storms however its magnitude is not found maximum neither during the initial phase of the storm, i.e. at the instant of the interplanetary shock nor during the main phase, the instant of minimum disturbance storm time (Dst) index. It is also investigated that there is a time delay between the maximum value of southward Bz and the Dst minimum, and this time delay can be used in the prediction of the intensity of a magnetic storm two-three hours before the main phase of a geomagnetic storm. We have found some more factors influencing the initiation of storm like, the speed of the solar wind, plasma beta should be low and, most importantly, the plasma temperature should be low enough for intense storms.