RESEARCH PAPER | Physics | Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

Effect of Halo Cmes on Interplanetary Magnetic Field

KEYWORDS: Coronal Mass Ejection (CME), Interplanetary Magnetic Field (IMF B)

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ABSTRACT *In this work we have done a systematic study to show the influence and association of halo CMEs with interplanetary magnetic field (B). Chree analysis of super epoch method has been adopted to draw the effects of halo CMEs with interplanetary magnetic field (B) for the period of 2006 to 2012. We can observe the increase in the value of IMF B after the two to three days from the onset day (zero days). Onset day is corresponding to occurrence date of halo CMEs. Increase in the value of IMF B is seen for most of the years in our analysis.*

INTRODUCTION

Halo CME, expand rapidly and appear to surround the occulting disk of the observing coronagraph. Halo CMEs have now been shown to be an important factor affecting the physical conditions in the entire heliosphere, not just the sun-earth connection. In recent study, it is observed that halo CMEs affect the interplanetary features and also generate geomagnetic storm near earth environment (Michalek et al., 2007). The north–south component of IMF Bz plays a dominant role in determining the amount of solar wind energy to be transferred to the geo-magnetosphere (Arnold, 1971). The occurrence of geomagnetic storms is well associated with Earth–directed coronal mass ejections (CMEs), which appear in coronagraph images as bright halos around the occulting disk (Howard et al., 1982).

In recent studies Coronal Mass Ejections are investigated as the main cause of geomagnetic disturbances (Gosling et al., 1991; Shrivastava & Singh, 2002). Mishra & Agrawal, (2013) reported significant enhancement in cosmic ray intensity which is observed after 3-4 days of the onset of asymmetric full halo and 5-6 days after the onset of full halo CMEs. The fluctuations in cosmic ray intensity are more prior to the onset of both types of the CMEs. They have also reported that during Partial Halo CMEs the cosmic ray intensity peaks, 8- 9 days prior to the onset of CMEs and depressed 2-3 days prior to the onset of CMEs, whereas in case of asymmetric and complex full CMEs, the intensity depressed 2-3 days prior to the onset of CMEs and enhanced 2-3 days after the onset of CMEs.

DATA DETECTION AND METHOD OF ANALYSIS:

In this work we have done chree analysis for the period of 2006 to 2012, to show the influence of halo CMEs on interplanetary magnetic field (IMF B), represents the important interplanetary parameter, which indicate the condition of interplanetary space environment. We have observed the yearly occurrence of total halo CMEs event from SOHO/LASCO CME catalogue and the corresponding daily values of IMF B are compiled from Omni web data explorer for five days before to ten days after the Occurrence of halo CMEs event. The daily values of IMF B are averaged for the total number of halo CMEs occurred on any particular year. In the graph, the onset day (zero days) represents the day of occurrence of halo CMEs and the number of total halo CMEs (yearly) are given in parenthesis.

DISCUSSION AND RESULTS:

Fig.1 shows the plot of chree analysis, with daily value of IMF B for - 5 to +10 days, have been plotted to study the effects of occurrence of halo CMEs. The analysis has been done for the period 2006 to 2012. From graph, it is clear that the halo CMEs is occurred maximum in the year of 2011 and 2012 (13 & 11 halo CMEs respectively) while CMEs occurrence is less in the year of 2007 to 2009. We can observe the increase in the value of IMF B after the two to three days from the onset days (zero days). Onset day is corresponding to the occurrence date of halo CMEs. Increase in the IMF B value is seen for most of the years.

CONCLUSION:

Our analysis indicates significant increase in the value of interplanetary magnetic field (IMF B) due to influence of halo CMEs for the time interval of 2006-2012.

ACKNOWLEDGEMENT:

The author's are grateful to the world data centers especially to the SOHO/LASCO CME catalogue for providing the all necessary halo CMEs data and Omni web data explorer for providing the data of interplanetary magnetic field (B) through the web.

Volume : 5 | Issue : 3 | March 2015 | ISSN - 2249-555X

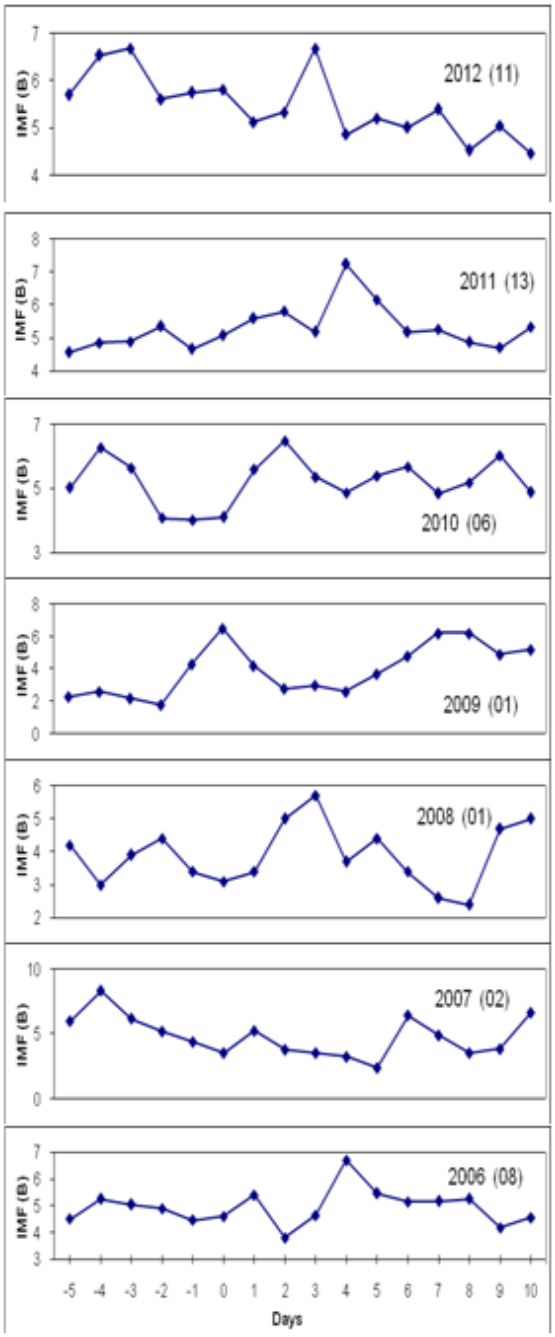

Fig-1: Shows the Chree analysis for averaged values of IMF (B) and Halo CME events, for the year of 2006 to 2012. In the graph, the onset day (zero days) represents the day of occurrence of halo CMEs and the number of total halo CMEs (yearly) are given in parenthesis.

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