

Correlative Study of Geomagnetic Field with Solar Parameters during 2008-2020.

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ABSTRACT:- In present work deals the associations of interplanetary magnetic field (B) with annual mean of solar parameters in a long period, during 2008 to 2020. It is found that the value of interplanetary magnetic field shows the increasing trend with solar parameters & also found that, the correlation coefficient is higher during 2008-2020. During the minimum phase of solar cycle, interplanetary magnetic field is higher & show controversial results for previous solar cycle.

Keyword:- Geomagnetic Field (B), Sunspot Number (Rz), Ap Index, Solar Disturbance Index (Dst).

I. INTRODUCTION:-

Cosmic ray intensity as observed on the earth surface, exhibit an approximate 11 year variation anti-correlated with solar activity (Webb et al 2003). Solar output in terms of solar plasma & interplanetary magnetic field ejected out into interplanetary medium consequently create the perturbation in the interplanetary magnetic field. The 11-year solar cycle is the best known variability in the sun so we have investigated association of interplanetary magnetic field with cosmic ray intensity on long-term basis. Joselyn & McIntosh (1981) have shown that the solar disappearing filaments have also been linked with large geomagnetic activities & interplanetary magnetic field. The cosmic ray intensity monitored at neutron monitor energies is found varying with an eleven year cycle (Shrivastava, et al 1993; Singh et al. 1999; Shrivastava et al 2003). This solar modulation takes place as galactic cosmic ray propagation through the region around the sun. In this work, we have an approach slightly different from that used by earlier worker (Grade et al 1983).

II. METHOD OF ANALYSIS:-

For present investigated, we have sorted out interplanetary magnetic field during 2008 to 2020, data of interplanetary magnetic field taken from International Service of Geomagnetic Indices (ISGI). Data of Solar Parameters taken by National Geophysical Data Centre (NGDC) at www.ngdc.noaa.gov.website & by U.S. Dept. of commerce. NOAA, Space Environment Centre.

III. RESULTS & DISCUSSION:-

To show the Annual mean of solar parameters such as Sunspot number (Rz), Ap Index, Dst and interplanetary magnetic field we plotted the yearly mean values of the geomagnetic parameters for the period of 2008 to 2020 as shown in figure 1.1, which cover the solar cycle 24, whose correlation curve plotted in fig 1.2, which implied positive correlation & correlation coefficient. Similar curve plotted in fig 1.3 for Ap indices during the period of 2008 to 2020 which cover solar cycle 24, whose correlation curve plotted in fig 1.4, which gives positive correlation between interplanetary magnetic field & Ap indices. Similar curve plotted in Fig 1.5, for Dst during period of 2008 to 2020 which cover solar cycle 24, whose correlation curve plotted in fig 1.6, which gives negative correlation between interplanetary magnetic field & Dst indices. The scales for the values of interplanetary magnetic field (B) with Sunspot number and Ap index clearly demonstrate a good correspondence between Solar parameters & interplanetary magnetic field (IMF) along with some peculiarities. The correlation of Interplanetary Magnetic Field with Sunspot number is $r = 0.7632$, with Ap Index $r = 0.8731$ and with Dst $r = -0.8608$.

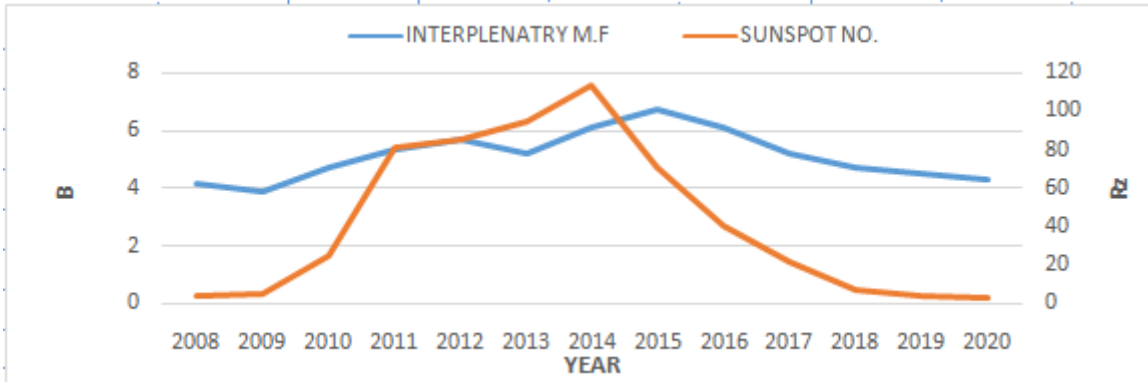


Fig 1.1:- Shows linear correlation curve for IMF &Sunspot Number during 2008 to 2020.

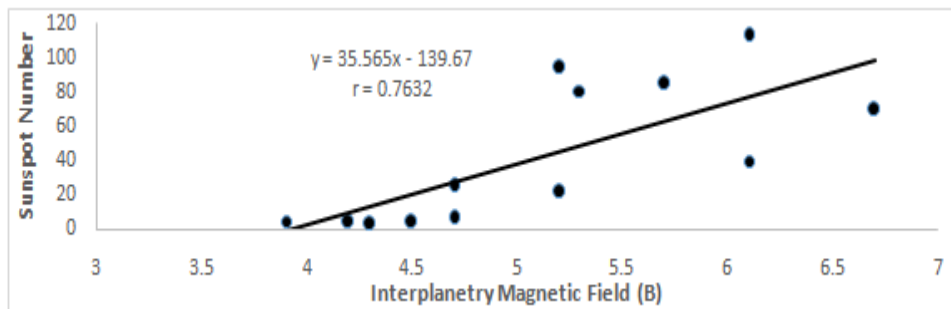


Fig 1.2:- Shows linear cross-correlation curve for IMF &Sunspot number during 2008 to 2020.

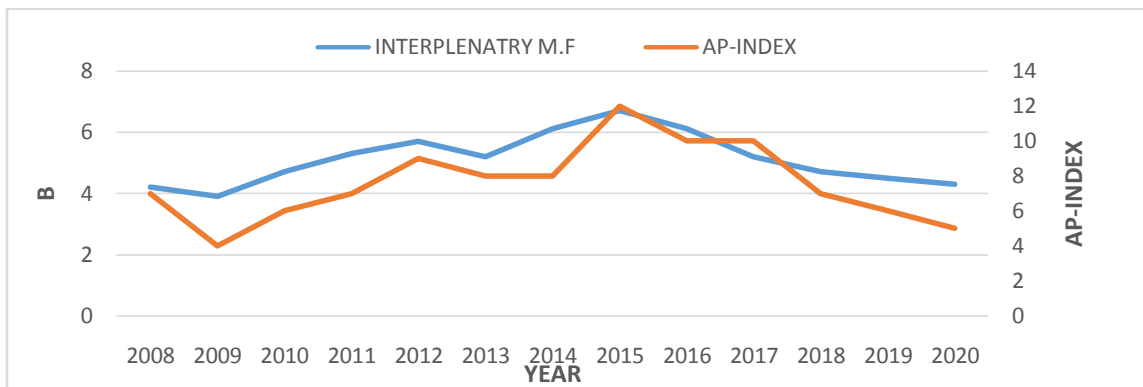


Fig 1.3:- Shows linear correlation curve for IMF &Ap Index during 2008 to 2020.

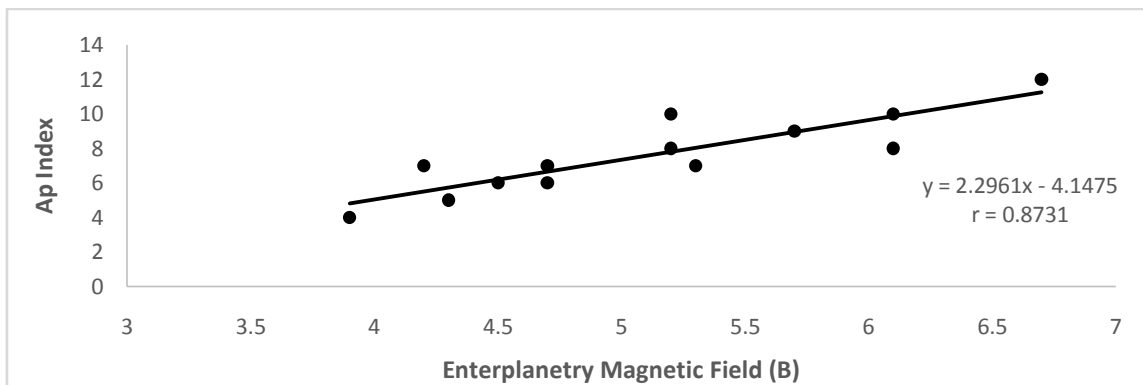


Fig 1.4:- Shows linear cross-correlation curve for IMF &Ap Index during 2008 to 2020.

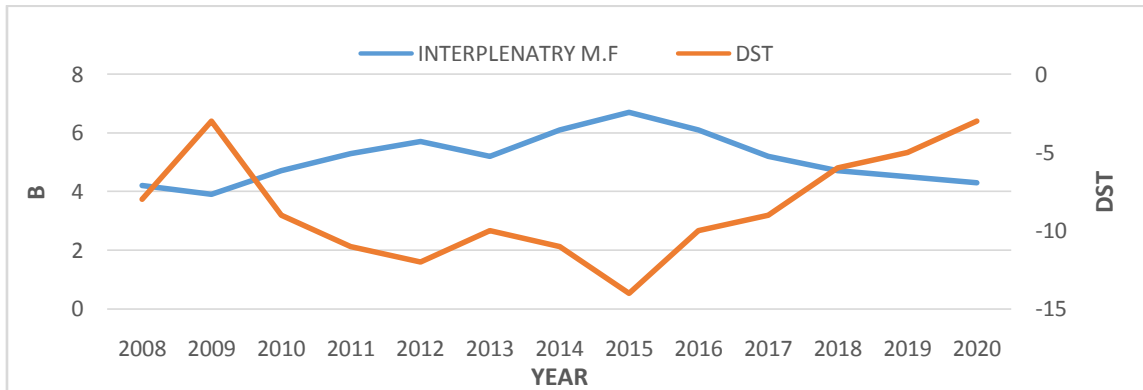


Fig 1.5:- Shows linear correlation curve for IMF & Dst during 2008 to 2020.

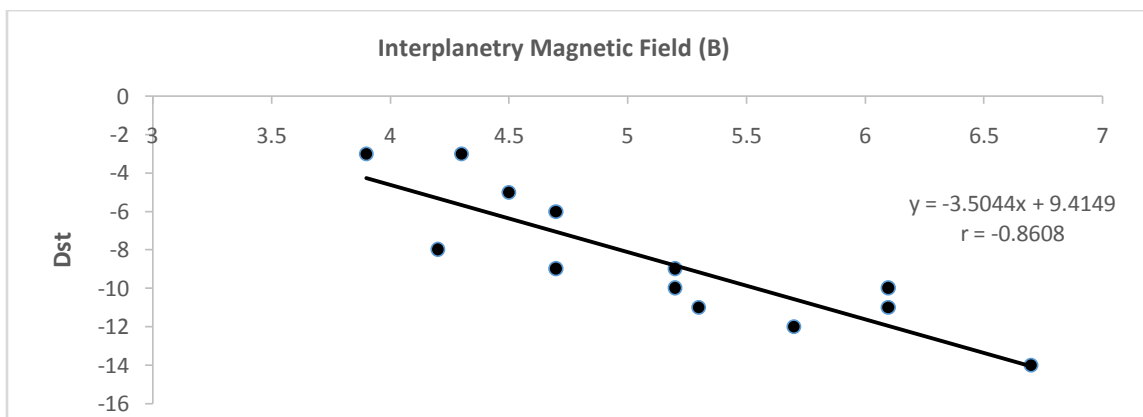


Fig 1.6:- Shows linear cross-correlation curve for IMF & Dst during 2008 to 2020.

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