ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 08, Issue, 01, pp.18545-18547, January, 2018

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

ASSOCIATION BETWEEN AVERAGES HSSW AND SSSW WITH DST AND PROTON FLUX DURING 2005 – 2009

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ARTICLE INFO

Article History:
Received 12th October, 2017
Received in revised form
26th November, 2017
Accepted 20th December, 2017
Published online 31st January, 2018

Key Words:
GS - Geomagnetic storm,
Dst - Disturbance storm-time,
CME - Coronal mass ejection,
ICME - Interplanetary coronal mass ejection.

ABSTRACT

In the present study we investigate the relationship among HSSW and SSSW with interplanetary parameters Dst and proton flow pressure for the time interval 2005 -2009. The present study investigates by means of stastical method employed for average values. The solar wind is classified into two categories-

- High speed solar winds (HSSW) which have value > 450.
- Slow speed solar winds (SSSW) which have value < 450.

We got the emergence of charged particles from sun varies and the variation causes change in various solar activities. The proton flux associated with both HSSW and SSSW depends upon solar cycle, it enhances as solar cycle progress, goes to a maximum values (which is approx in the mid of solar cycle) and then decreases.

Citation: Rajesh Mathpal and Lalan Prasad, 2018. "Association between averages hssw and sssw with dst and proton flux during 2005 – 2009", *International Journal of Development Research*, 8, (01), 18545-18547.

INTRODUCTION

The solar activity varies with the solar cycle whereas. The solar activities varies greatly with several solar phenomena such as Dst, proton flux etc. The solar wind shows great signature with dst and proton flux. The GS changes the dynamic pressure of the solar wind and the orientation of the IMF which is responsible to change the dynamic structure of earth's magnetosphere. The relation varies during solar cycle where the GS occurs within 5 days after the onset of coronal mass ejection and variation in geomagnetic disturbance generally follows the phase of the solar cycle Prasad et.al 2013. The solar wind is an important parameter for occurrence of geomagnetic disturbance. When CME from Sun propagate in interplanetary space it creates disturbances in solar wind. Effect of Solar Flare and Coronal Mass Ejection in our Earth atmosphere studied.

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Inter planetary Coronal Mass Ejection (ICME) when arrive near the earth it contains solar wind plasma ahead of high speed solar wind, this compressed solar wind plasma exerts a dynamic pressure on Earth's magnetosphere. The interaction between slow and fast solar wind produce shock waves and velocity discontinuity that is tangential to the interface separating the fast and slow streams. These discontinuity leads to inter-planetary disturbances as well geomagnetic field variation. The IMF irregularities cause a time varying electric field, E = - V×B, where V is the solar wind velocity and B is the interplanetary magnetic field Dungey 1961. These electric field help to turn IMF Bz to southward along to the geomagnetic disturbance. A number of research work have been done time to time to show the relationship between solar wind and geomagnetic activity Khandayat *et al*. 2011 and Mathpal et.al 2016. The Interplanetary magnetic field Bz component is generated as a result of solar wind turbulence and wave generation. The GS changes dynamic pressure of the solar wind and the orientation of the IMF is responsible to change the dynamic structure of earth's magnetosphere. When CME from the Sun propagate in interplanetary space it creates disturbances in solar wind.

The variation in phase of Dst and solar wind speed shows a strong correlation of solar wind speed with geomagnetic activity i.e. during high geomagnetic period high speed solar wind enters on Earth's magnetosphere, these solar wind produces large changes on Earth's magnetosphere.

Data Collection and Analysis

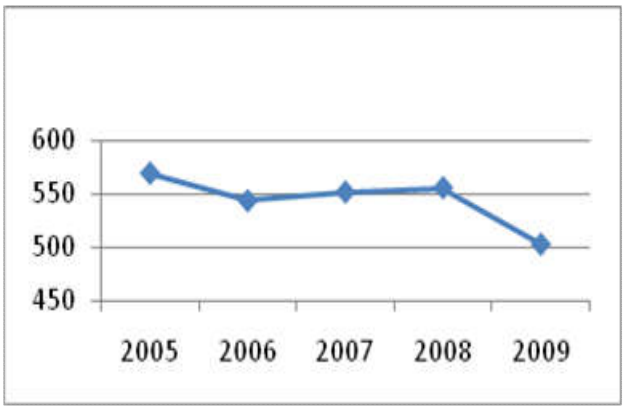

Figure 1. Variation of high speed solar wind

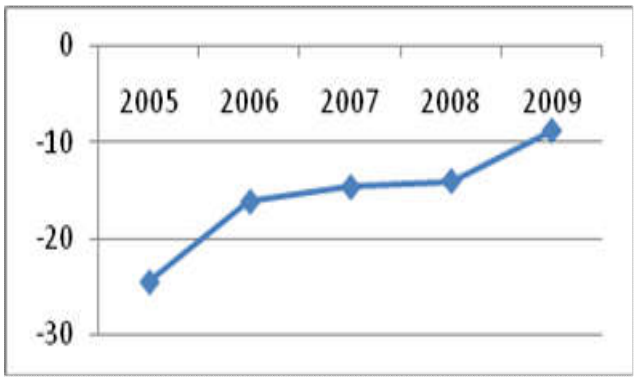

Figure 2. Variation of Dst associated with high speed solar wind

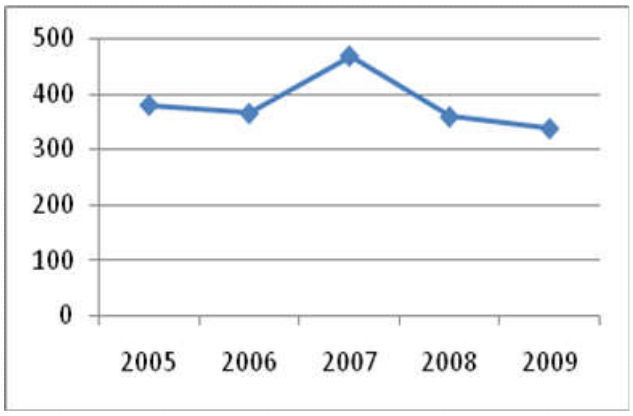

Figure 3. Variation of slow speed solar wind

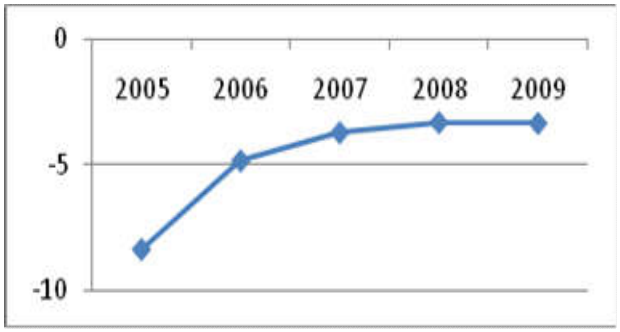

Figure 4. Variation of Dst associated with slow speed solar wind

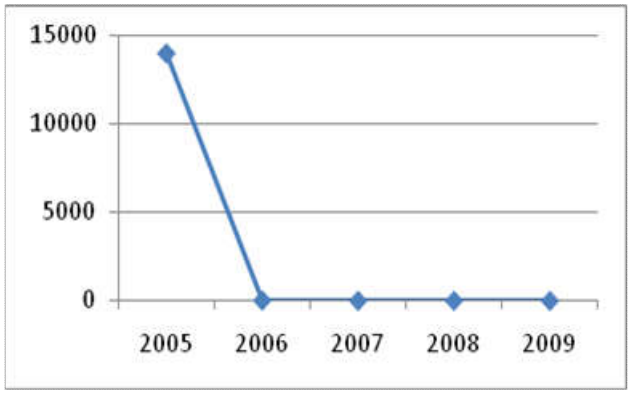

Figure 5. Variation of proton flux associated with high speed solar wind

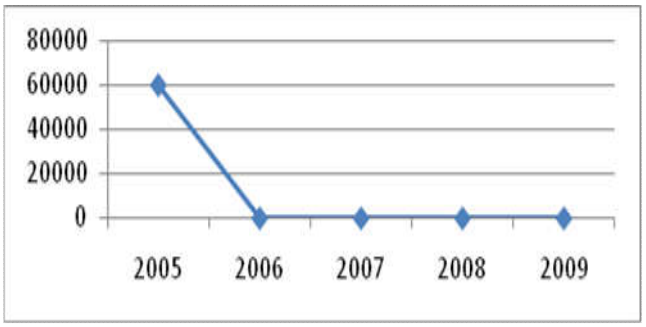

Figure 6. Variation of proton flux associated with slow speed solar wind

RESULTS

Table 1.

YEAR	HSSW	DST HSSW
2005	569.51	-24.56
2006	543.89	-16.21
2007	552	-14.68
2008	555.93	-14.05
2009	503.37	-8.82

Table 2.

YEAR	SSSW	DST SSSW
2005	379.6	-24.56
2006	364.25	-16.21
2007	309.17	-4.36
2008	358.19	-3.33
2009	336.74	-3.36

Table 3.

YEAR	HSSW	PROTON FLUX HSSW
2005	569.51	13988.55
2006	543.89	17.86
2007	552	0.1929
2008	555.93	0.2.124
2009	503.37	0.222

Table 4.

YEAR	SSSW	PROTON FLUX SSSW
2005	379.6	60002.26
2006	364.25	0.19125
2007	309.17	0.2404
2008	358.19	0.1807
2009	336.74	0.2310

Conclusion

In present study we have taken 5 years data from 2005 - 2009. The data are analyzed in the form of graph from fig. 1 to 6 and Table 1 to 4. The fig. 1 shows the graph of average HSSW is decreasing as the solar cycle 23 ends and the decrease further continuous in next solar cycle i.e. 24. This clearly depicts that the emergence of charged particles from sun varies and the variation causes change in various solar activities. The fig.3 shows the graph of average SSSW, the average SSSW increases as the solar cycle 23 ends again in next cycle 24 it further decreases as the solar cycle progresses. The proton flux of HSSW and SSSW is highly negative correlated with Dst. It shows that high values of proton flux will decreases the disturbance storm time (Dst) for both HSSW and SSSW i.e. it is independent of the nature of the solar wind (or solar wind speed). The proton flux associated with both HSSW and SSSW depends upon solar cycle, it enhances as solar cycle progress, goes to a maximum values (which is approx in the mid of solar cycle) and then decreases. The proton flux suddenly increases the sudden increase in proton flux is the result of solar activities of few years before that year. The sudden emergence of this flux takes solar cycle to an end.

Acknowledgments

The authors are thankful to IUCAA, Pune for content page service and also thankful to ARIES, Nainital for providing library and computing facilities.

Thankfully, Acknowledge the UGC, New Delhi for financial assistance under the MRP No. F42-825. We are also thankful to website http://omniweb .gsfc.nasa.gov/cgi/nx1.cgi. for the data collection.

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