A COMPARATIVE STUDY OF SSN AND DST FOR SOLAR CYCLE 23 AND 24

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ABSTRACT-

In the present study we have investigated the impact of sunspot numbers on geomagnetic stroms. In our study Disturbance storm time (Dst) index is taken as a measure of Geomagnetic Storm (GS). We have investigated SSN with Dst (≤ -50 nT) during the time interval 1997-2016. The comparative study of dst and SSN shows V shaped structure. The study shows symmetric and asymmetric structures. This shows the variation in geomagnetic field is greatly affected by various phase of solar cycle. The phase relationship caused due to differential rotations of Sun causes change in ring current shielding the earth. This causes change in geomagnetic activity. This study is important for studying the space weather phenomenon.

Keywords: GS - Geomagnetic storm, Dst - Disturbance storm-time, CME - Coronal mass ejection, ICME - Interplanetary coronal mass ejection, SSN – Sunspot Number.

INTRODUCTION-

The Dst index is a measure in the context of space weather. It gives information about strength of ring current around earth caused by solar protons and electrons. The ring current around earth produces magnetic field that is directly opposite Earth's magnetic field i.e. if the difference between solar electron and protons gets higher then Earth's magnetic field becomes weaker. During a geomagnetic storm, the number of particles in the ring current increases which causes a decrease in geomagnetic field. During a geomagnetic storm, the number of particles in the ring current increases which causes a decrease in geomagnetic field. The solar wind is highly correlated to Dst in mid of solar cycle-23 which represents the maximum solar activity years (Mathpal et al., 2016). 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., 2013b).

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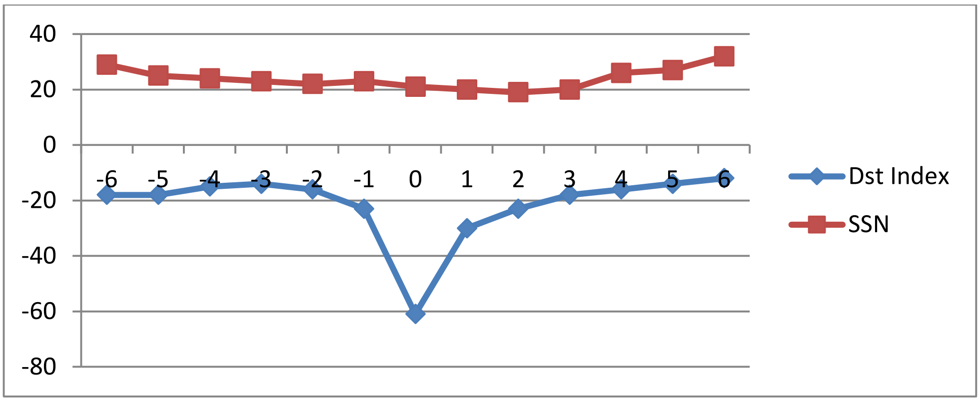
Inter planetary Coronal Mass Ejection (ICME) when arrive near the earth it contains solar wind plasma ahead of high speed solar wind, this compressed solar wind plasma exerts a dynamic pressure on Earth's magnetosphere (Prasad et al.2013). Many investigators have studied the association of geomagnetic activity to magnetic clouds and other IMF features (Farrugia, Burlaga, and Lepping, 1997; Tsurutani and Gonzalez, 1997).

DATA COLLECTION AND ANALYSIS-



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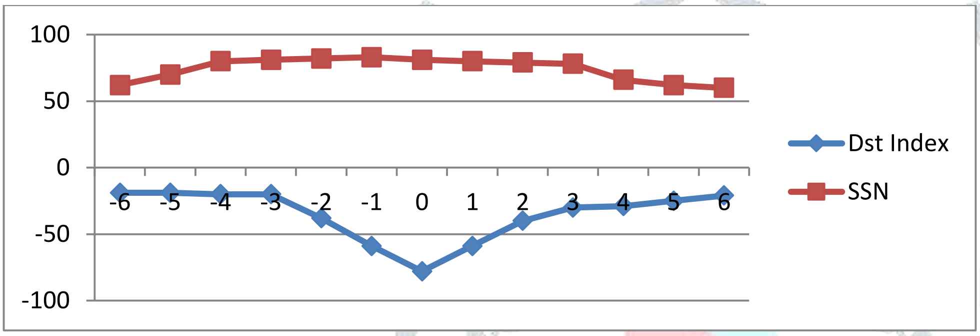

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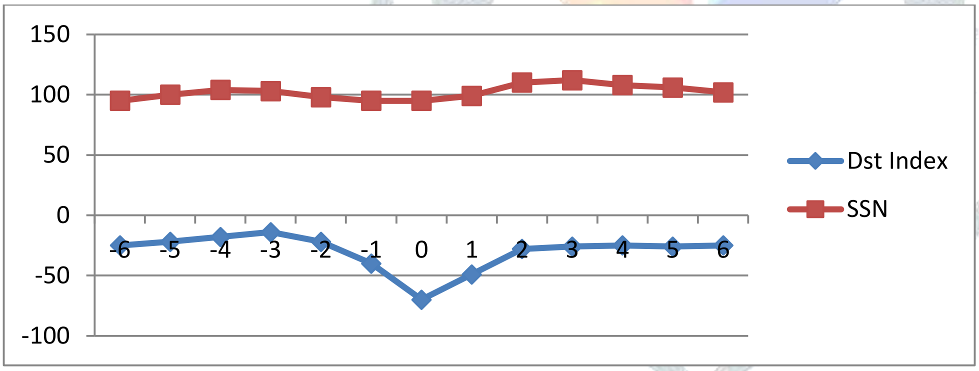

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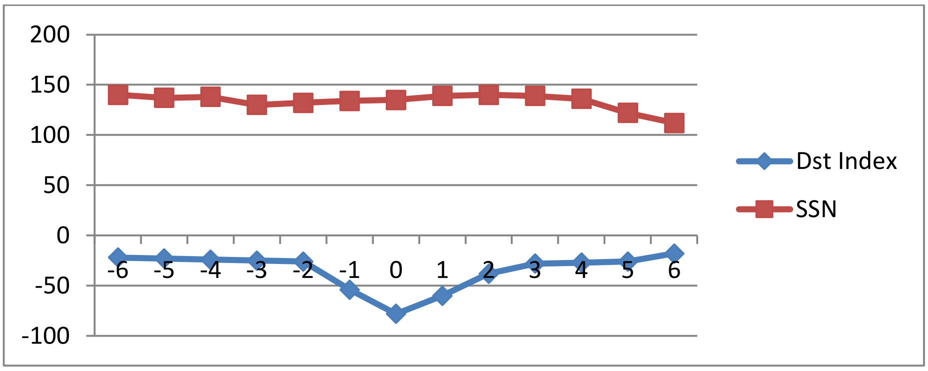

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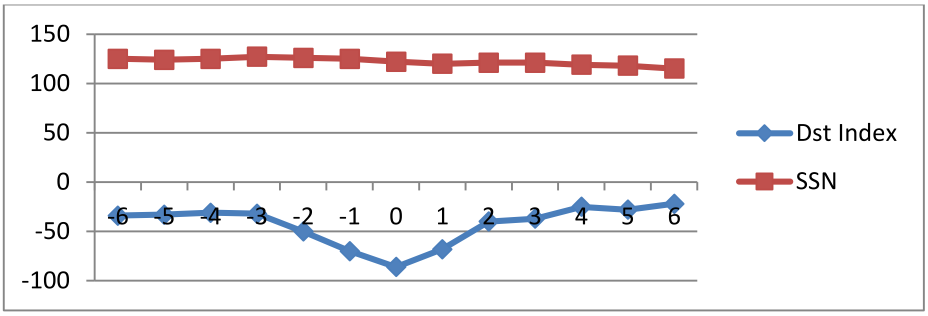

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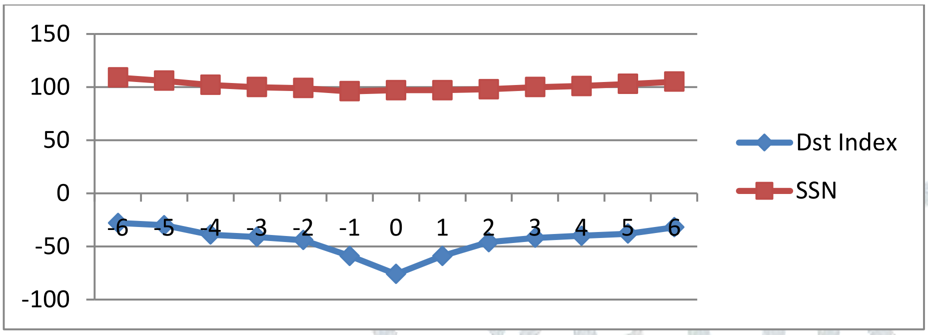

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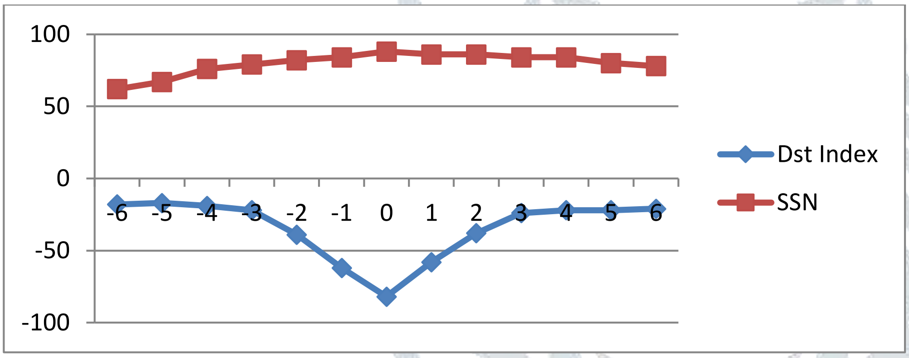

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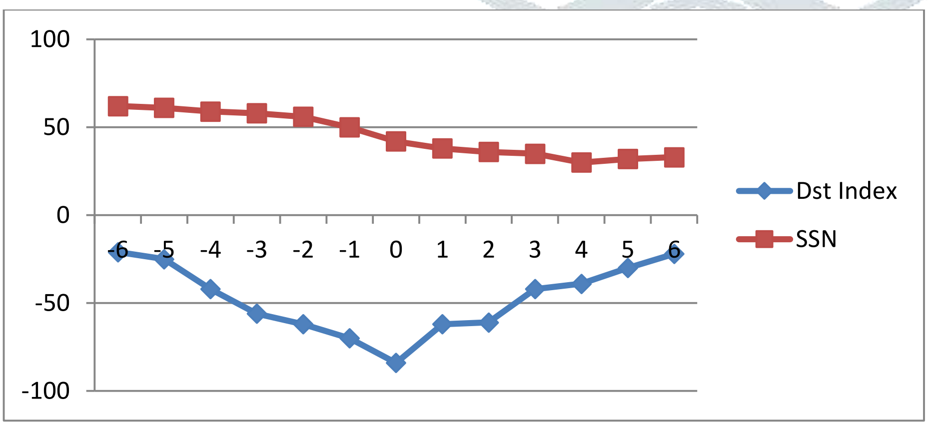

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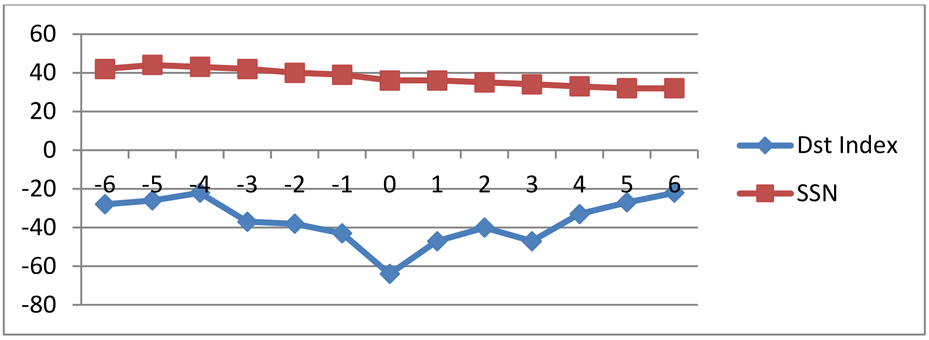

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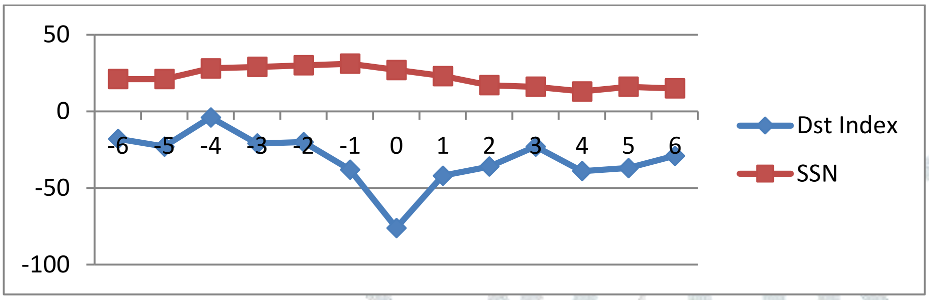

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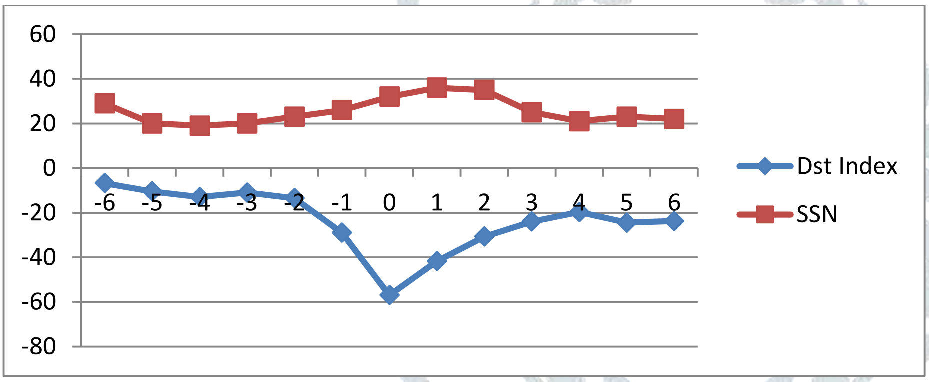

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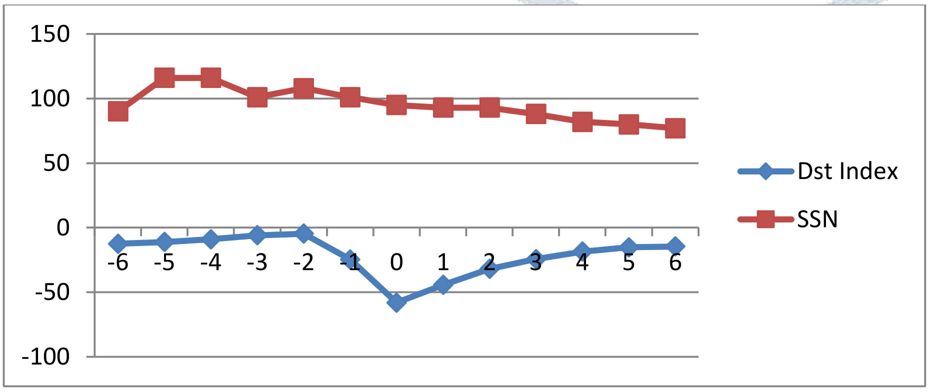

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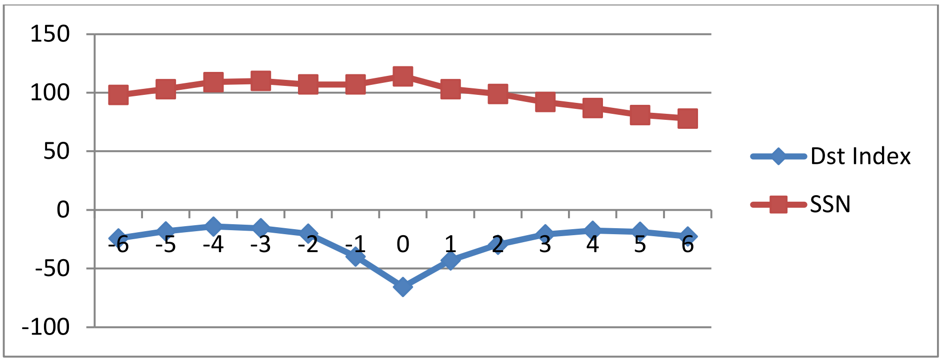

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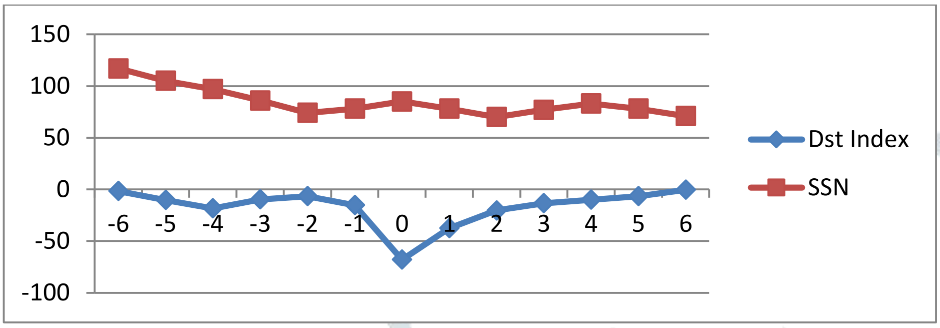

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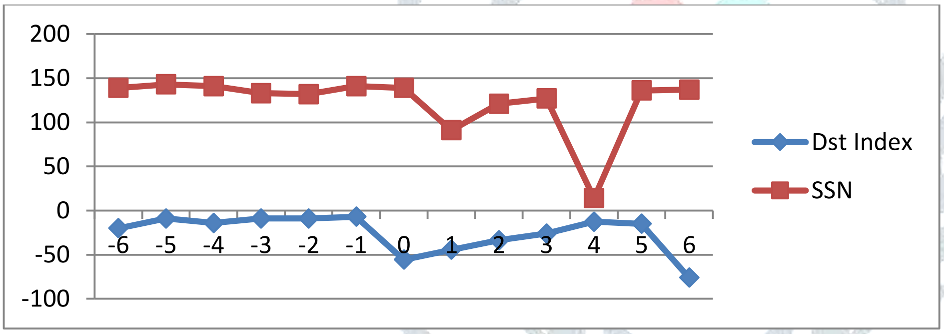

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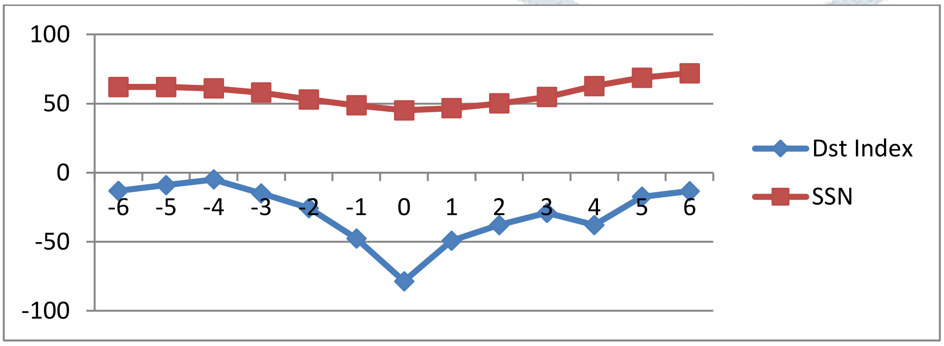

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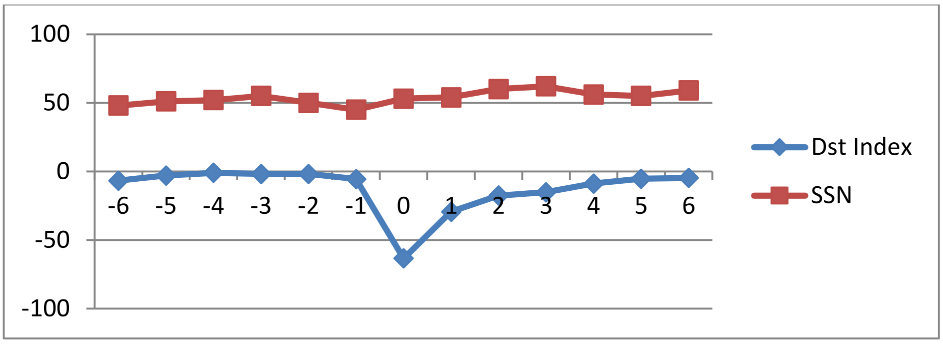
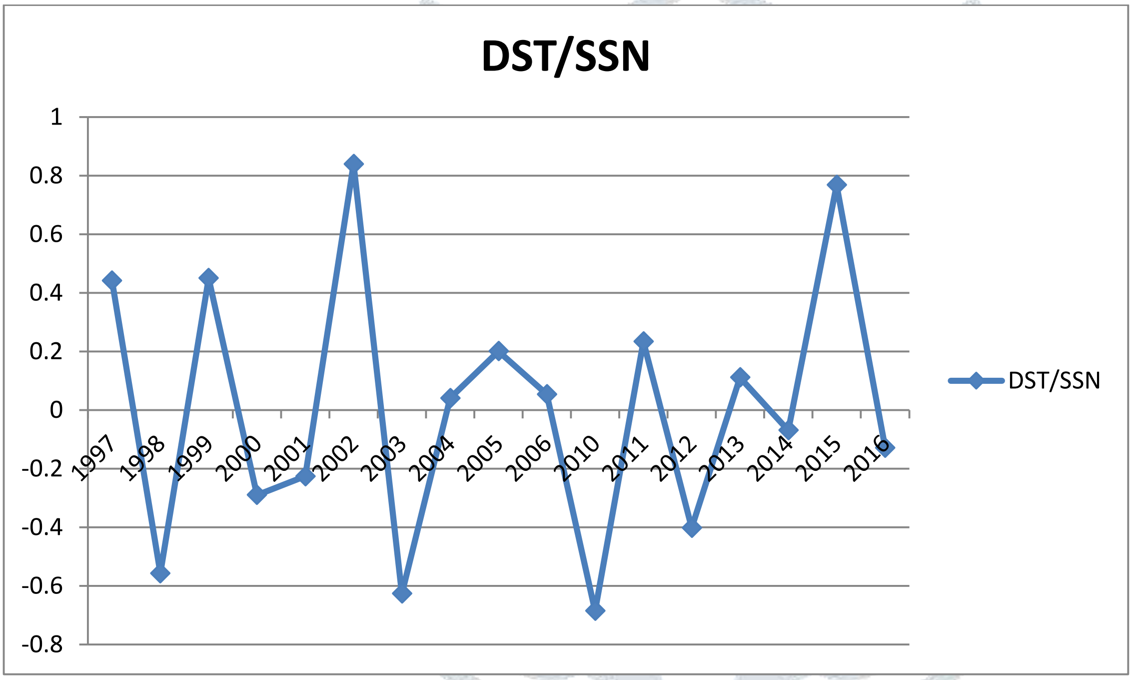


YEAR: 2016

CORRELATION GRAPH –



S. No.	Parameters	Solar cycle	Correlation coefficient
1	Dst index and SSN	23	0.032703
2	Dst index and SSN	24	-0.02461

Results -

1) For 2002 dst is highly correlated with SSN. This indicates high SSN for this year weakened the earth's magnetic field which causes high ring current.
2) Similar peak is obtained for year 2015.
3) The correlation becomes weak at the end of 23 solar cycles, disappears for 2007,2008 and 2009.
4) For solar cycle 24 correlation rise from low to high.

5) For years 1998, 2003 and 2010 it is highly negatively correlated.
6) For years 1997 and 1998 there is good correlation.

Conclusion – The comparative study of dst and SSN shows V shaped structure. The study shows symmetric and asymmetric structures. This shows the variation in geomagnetic field is greatly affected by various phase of solar cycle. The phase relationship caused due to differential rotations of Sun causes change in ring current shielding the earth. This causes change in geomagnetic activity. This study is important for studying the space weather phenomenon. This study also suggests that solar storms are influenced by SSN.

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