ORIGINAL RESEARCH PAPER | **Physics**

STUDY OF HIGH-SPEED SOLAR WIND STREAMS EVENTS & SOLAR PROTON DENSITY DURING SOLAR CYCLES 22 & 23.

KEY WORDS: Solar wind streams (V), Cosmic ray intensity (CRI), Solar Proton density (D).

S.G. Singh	Department of physics Govt. P.G. College Panna (M.P.).
N.K. Patel	Department of physics Govt. P.G. College Panna (M.P.).
P.R. Singh	Department of physics Govt. P.G. College Panna (M.P.).
S.C Chaturvedi	Department of physics Govt. Lahiri College Chirimiri, Koriya (C.G.)

ABSTRACT

A geomagnetic storms is a global disturbance in Earth's magnetic field usually occurred due to abnormal conditions in the interplanetary magnetic field (IMF) & solar wind plasma emissions caused by various solar phenomenon. 138 solar wind streams in solar cycle 22 & 173 solar wind streams in solar cycle 23, have been found, which are associated with proton density, observed during 1986 to 2010. We have analyzed & studied them statistically. We have found that yearly occurrences of geomagnetic streams are strongly correlated with proton density in 11-years sunspot cycle, but no significant correlation between the maximum & minimum phase of solar cycle 22 & 23 have observed.

INTRODUCTION:-

It has been known since long time that the sun & its outputs are the common source of origin of several sporadic cosmic ray intensity variations such as solar wind streams & plasma density. Solar wind streams are of importance to the solar physics as well as cosmic ray modulation studies as they release vast amount of matter & radiation in short-time (**Cone** & **Richardson**, 1995; **Shrivastava** & **Jaiswal**, 2003). Distribution of solar wind streams around the sun & their association with various geomagnetic & cosmic ray intensity has been studied by several workers from time to time (**Hotton**, 1980; **Grade** et al 1983; **Shrivastava** 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 (**Singh** et al 2012).

The first tentative direct observation of the solar wind was reported by **Biber**, **Pomerantz** & **Taso** (1983) form the Russian space probe Lunik-2. The data have been examined for the long- term variation. Wang & **Sheelay**, 1988; **Bolton** 1990; **Gazis** 1996 showed that when long-term averages are considered the correlation between geomagnetic activity & solar wind velocity is indeed very striking. He found significant variation from one cycle to next.

Method of Analysis:-

In this analysis we have used the stream time annual values of solar wind speed & plasma density for the period of 1986 to 2010. The basis data are the mean daily values, which are taken from the OMNI website. Then we used a statistical technique to correlate them.

RESULT & DISCUSSION:-

The sun & its outputs in form of various interplanetary features such as plasma density, solar wind streams & interplanetary magnetic field are related to the disturbances in earth magnetic field. Earlier a number of investigators have studied & reported significant relationship among interplanetary plasma parameters for the period of solar cycles 22 & 23 (**Mishra** et al 2000, **Singh** & **Shrivastava**, 2002). In the present analysis we have taken the period 1986 to 2010, which cover solar cycle 22 & 23. Fig 1.1 & fig 1.3 show the line cross-plot between solar wind stream & plasma density for corresponding solar cycle 22 & 23. Fig 1.2 & fig 1.4 show the cross-correlation between solar wind stream & plasma density for the period of 1986 to 1996 & 1997 to 2010, which cover solar cycle 22 & 23. These figures show positive correlation between SWS & plasma density. It is revealed that correlation coefficient for solar cycle 22 is 0.0268 but for solar cycle 23 is 0.1845, which is higher than previous solar cycle 22.

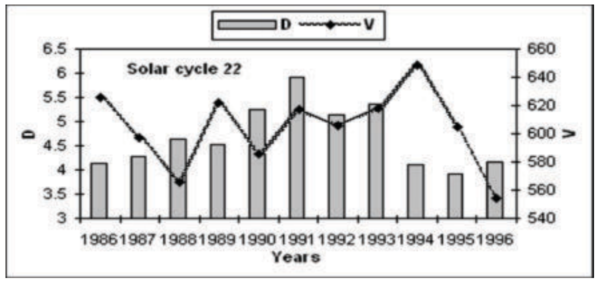

Fig 1.1:- Line cross-plot between SWS & Plasma Density (D) for 1986-1996.

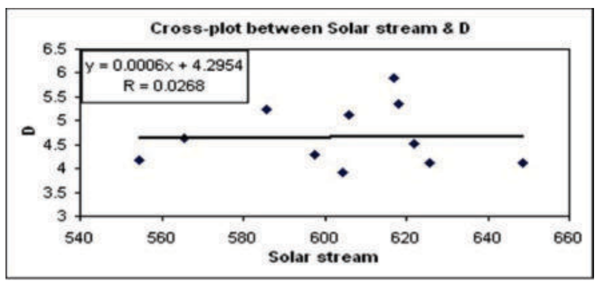

Fig 1.2:- Cross-correlation between SWS & Plasma Density (D) for 1986-1996.

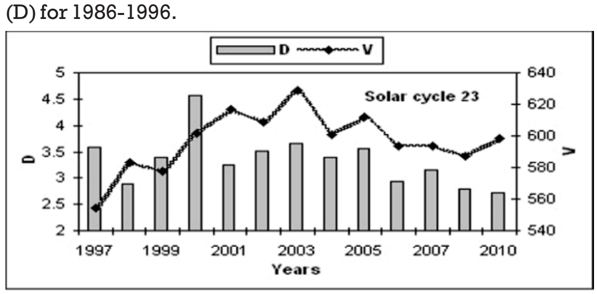

Fig 1.3:- Line cross-plot between SWS & Plasma Density (D) for 1997-2010.

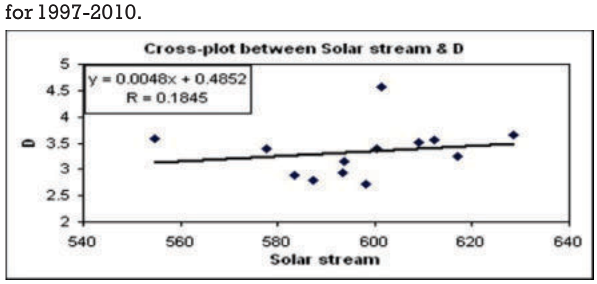

Fig 1.4:- Cross-correlation between SWS & Plasma Density (D) for 1997-2010.

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