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Solar Wind Plasma Parameters in Relation with Good Quality Magnetic Cloud Related Geomagnetic Storms

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ABSTRACT: We have analyzed magnetic cloud related geomagnetic storms detected during the period of solar cycle 23 and 24 with disturbances in solar wind plasma parameters. We have observed that all the MC related geomagnetic storms are accompanying with disturbances in solar wind plasma parameters. The magnitude of magnetic cloud related geomagnetic storms is soundly correlated with peak disturbances values of solar wind plasma parameters solar wind plasma velocity (SWPV), solar wind plasma density (SWPD), solar wind plasma temperature (SWPT), interplanetary magnetic fields (IMFB) and southward component of interplanetary magnetic fields (IMFBz). Large positive correlation with correlation coefficient 0.60 have found between magnitude of MC related GMS and peak value of related disturbances in IMFB and 0.67 between magnitude of MC related geomagnetic storms and peak value of associated disturbances in IMFBz. Additionally positive correlations with correlation coefficient 0.54 have been found between magnitude of MC related GMS and peak value of associated disturbances in solar wind plasma temperature ,0.40 between magnitude of MC related GMS and peak value of associated disturbances in solar wind plasma velocity, 0.27 between magnitude of MC related geomagnetic storms and peak value of disturbances in soar wind plasma density.

KEY WORDS: Geomagnetic storms, Magnetic Clouds, Interplanetary magnetic fields, Southward Component of Interplanetary magnetic fields, solar wind plasma velocity, solar wind plasma temperature.

1.0-INTRODUCTION

Geomagnetic storms are turbulences in earth's magnetic field formed by heightened solar wind– magnetosphere coupling and ionosphere–magnetosphere plasma coupling (Svalgaard 1977; Gonzalez et al. 1994). The geomagnetic storm has three different phases: sudden storm commencement (SSC) trailed by the initial phase, the main phase, and the recovery phase (Akasofu et al., 1963; Kamide et al., 1997). SSC results from the magnetosphere's abrupt compression due to the solar wind's high energetic pressure. It origins a rapid upsurge in Chapman Ferraro current, growing the horizontal components of the Earth's magnetic field (Dessler et al., 1960). If the downstream of the interplanetary shock has high density, high pressure, and high solar wind speed, then the horizontal constituent of the Earth's magnetic field remains high ($\sim$ 50nT) for a few hours. Such an heightened geomagnetic field tailed by SSC is mentioned to as the initial phase of the storm. Succeeding the initial phase, a decrease in the Earth's horizontal magnetic constituent is observed, termed the storm's main phase. The main phase is related to the southward IMF mechanisms of the solar wind. The cause of the main phase is the intensification of the ring current; the higher the ring current magnitude, the robust the storm (Frank, 1967; Smith & Hoffman, 1973). The duration of the main phase last for about 12 to 24 hours. It is shadowed by a storm's recovery phase, in which the Earth's magnetic field recovers to its original ambient value. Mostly, the recovery phase of the storm happens when the southward IMF turns in the northward direction. The ring current's decay or wearying causes the storm's recovery phase. The rate of ring current decay adopts the rate of the recovery phase of the storm. Depending on the causing agent of the storm, the time duration of the recovery phase ranges from one day to numerous days. The decay of the ring current shaped by the charge argument, or by Coulomb interaction, or wave-particle interaction developments (Daglis et al., 1999; Kozyra & Liemohn, 2003; Chen et al., 1997; Jordanova, 2020; Choraghe et al., 2021; A. N. Raghav et al., 2019). Geomagnetic storms arise when the interplanetary magnetic field (IMF) orients southward and remains southern for a long time (> 3Hr) (W. Gonzalez et al., 1994). The long extent southward component of IMF usually observed in in-situ observation of 1) Interplanetary Coronal Mass Ejections (ICMEs) (Kamide, Baumjohann, et al., 1998; I. G. Richardson & Cane, 2012; Akasofu, 2018; Echer et al., 2008). 2)

Co-rotating Interaction Structures (CIRs) (I. Richardson et al., 2006; B. T. Tsurutani et al., 2006) 3) High Speed Stream (HSS) (Sheeley et al., 1976; Krieger et al., 1973). The solar and interplanetary features that cause magnetospheric turbulences has been examined for a long time and there is now a large body of experimental and hypothetical results (Balasubramaniam, et al 1996, Verma P.L 2016, Doha Al-Feadh et al 2019, Crooker, N.U., et al 1994,). The source of energy for geomagnetic spectacles is the sun, which transmissions energy to the earth's magnetosphere by the solar wind (SW). The SW energy arrives in the magnetosphere only when the interplanetary magnetic field (IMF) has an important component parallel to the worldly magnetic dipole, i.e., it has an approximately negative (southward) IMF *Bz* component (Manoharan, P. K et al 2004). Such behavior of the IMF can result in energy input into the magnetosphere and in the generation of magnetospheric disturbances Crooker, N.U., et al 2000, Doha Al-Feadh et al 2019, Gonzalez, et al 1987, Gonzalez, W.D., et al 1999,]. Solar wind (SW) strictures and geomagnetic (GM) indices are essential indicators to look at while trailing and prediction space weather events. Numerous studies have been conducted in the past to examine the relationship between these strictures during storm measures by employing a variability of scientific approaches (e.g., Kane et al., 2005; Echer et al., 2008; Guo et al., 2010; Adhikari et al., 2018; Poudel et al., 2019; Silwal et al., 2021a). While there are a variety of arithmetical tools available, In this specific study, we have accomplished correlative study of solar wind plasma parameters, solar wind plasma velocity, solar wind plasma density, solar wind plasma temperature, interplanetary magnetic fields and southward component of interplanetary magnetic fields with good quality magnetic cloud related geomagnetic storms observed during the period of solar cycle 23 and 24 to know the relationship between solar wind plasma parameters and good quality magnetic cloud related geomagnetic storms.

2.0-EXPERIMENTAL DATA

In this study good quality magnetic cloud related geomagnetic storms are examined with disturbances in solar wind parameters over the period of solar cycle 23 and 24. To determine disturbances in geomagnetic fields and solar wind plasma parameters, hourly data of Dst index and solar wind plasma velocity, density, pressure, interplanetary magnetic field have been used and data of Omniweb has been used. For the data of magnetic cloud, ACE list of transient and disturbances, magnetic clouds observed by WIND/MFI are used.

2.1 -Correlation between magnitude of good quality MC related geomagnetic storms and peak value of disturbances in interplanetary magnetic fields during solar cycle 23 and 24

The interplanetary magnetic field (IMF), nowadays more commonly mentioned to as the heliospheric magnetic field (HMF), is the constituent of the solar magnetic field that is heaved out from the solar corona by the solar wind flow to fill the solar system. In this segment we have scrutinized good quality magnetic cloud related geomagnetic storms with turbulences in interplanetary magnetic fields during solar cycle 23 and 24 .From the data investigation of good quality magnetic cloud connected geomagnetic storms and allied disturbances in interplanetary magnetic fields (IMFB) listed in table, it is detected that all the good quality magnetic cloud connected geomagnetic storms are associated with disturbances in interplanetary magnetic fields (IMFB) and from the crucial examination of hourly value of disturbances in IMFB and geomagnetic storms it understood that onset of good quality related geomagnetic storms starts after few hours to numerous hours to the beginning time of disturbances in IMF .To know the geometric behavior of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of allied disturbances in interplanetary magnetic fields (IMFB) and also to realize that how the magnitudes of good quality magnetic cloud related geomagnetic storms are correlated with peak value of interplanetary magnetic fields disturbances events, we have designed a bar diagram in figure 1 and a scatter plot between the magnitude of good quality magnetic cloud connected geomagnetic storms and peak value of disturbances in IMFB in figure 2. It is clear from the bar illustration that most of the good quality magnetic cloud related geomagnetic storms which have large storm magnitude are allied with such disturbances in IMFB which have large peak value, but the magnitude and peak values of these two events do not have any fixed proportion, we have found some good quality magnetic cloud related geomagnetic storms which have large magnitude but they are linked with such disturbances in interplanetary magnetic fields events which have small peak value and some good quality magnetic cloud connected geomagnetic storms which have small magnitude but they are allied with such interplanetary magnetic fields disturbances events having large peak values. These outcomes indicates that though these events do not have any measurable relation but the good quality magnetic cloud connected geomagnetic storms of higher magnitude is usually connected with such IMFB disturbances events which have

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comparatively higher peak values. Further from the crucial examination of the trend line of scatter plot shown in figure 2 ,it is observed that the trend line of the scatter plot shows strong positive correlation between good quality magnetic cloud related geomagnetic storms and peak value of associated disturbances in interplanetary magnetic fields (IMFB).Strong positive correlation with correlation coefficient 0.60 has been calculated by statistical method between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of IMFB disturbances during solar cycle 23 and 24.

Table -Good quality magnetic clouded related geomagnetic storms observed associated with disturbances in solar wind plasma parameters during solar cycle 23 and 24.

Date of GMS	On Set Time of GMs	Magnitude of GMs in nT	Peak Value of IMFB in nT	Peak Value of IMFBz in /nT/	Peak Value of Temperature in degree Kelvin	Peak Value of Velocity in Km/s	Peak value of Density in N/CC
29.05.2010	149(12)	-71	14.4	-13.8	157623	616	18.1
04.08.2010	216(1)	-69	17.3	-10.4	379929	597	15.8
04.02.2011	35(20)	-60	21.2	-15.6	591907	647	27.7
05.07.2011	186(0)	-56	10.1	-4.9	110718	407	7.3
10.09.2011	253(4)	-74	19.3	-14.2	661431	554	37.6
17.09.2011	260(15)	-75	13.6	-6.6	191388	544	29.5
26.09.2011	269(23)	-116	34.2	-16.4	869765	688	27
25.10.2011	298(1)	-146	24	-11.6	453597	514	27.9
09.03.2012	69(8)	-145	23.1	-16.1	1818664	729	16
09.07.2012	191(12)	-74	12.2	-11.2	238026	527	13.3
03.09.2012	247(10)	-67	19.8	-12.1	285912	544	24.2
13.10.2012	287(7)	-84	12.9	-10.9	329306	579	9.6
17.01.2013	17(23)	-53	14.7	-9.6	168541	416	44.4
01.05.2013	121(18)	-70	11.1	-8.8	317960	449	12.6
06.07.2013	187(16)	-84	12.8	-12.3	51920	365	19.9
19.02.2014	50(8)	-118	18.6	-14.5	310812	688	20.6
23.02.2014	54(19)	-53	12.1	-10.3	132105	512	23.7
12.02.2014	102(9)	-84	11.5	-8.7	125638	387	17.4
22.12.2014	356(5)	-62	26.3	-15.5	75638	419	24.6
04.01.2015	4(21)	-75	11.8	-8.8	443238	515	12.2
23.06.2015	174(4)	-196	37.7	-26.3	1122590	742	40.4
13.07.2015	194(15)	-65	9.9	-6.9	203764	642	7.3
16.08.2015	228(7)	-90	21.7	-9.6	316698	575	34.2

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27.08.2015	239(20)	-100	16.3	-13.1	184528	477	32.1
20.09.2015	263(15)	-77	15.8	-4.3	594563	623	10.1
04.11.2015	308(12)	-53	8.9	-3.9	361665	731	9.2
01.01.2016	1(0)	-115	16.9	-16.1	298118	481	25.5
20.01.2016	20(16)	-97	19.2	-11.4	390606	547	28.3
06.03.2016	66(21)	-98	20.1	-9	489564	590	27.7
03.08.2016	216(15)	-51	24.6	-10.3	524484	613	21.8
10.11.2016	315(17)	-56	12.8	-9.5	216666	463	30.9
26.08.2018	238(6)	-167	18.1	-14.7	305987	619	23.2

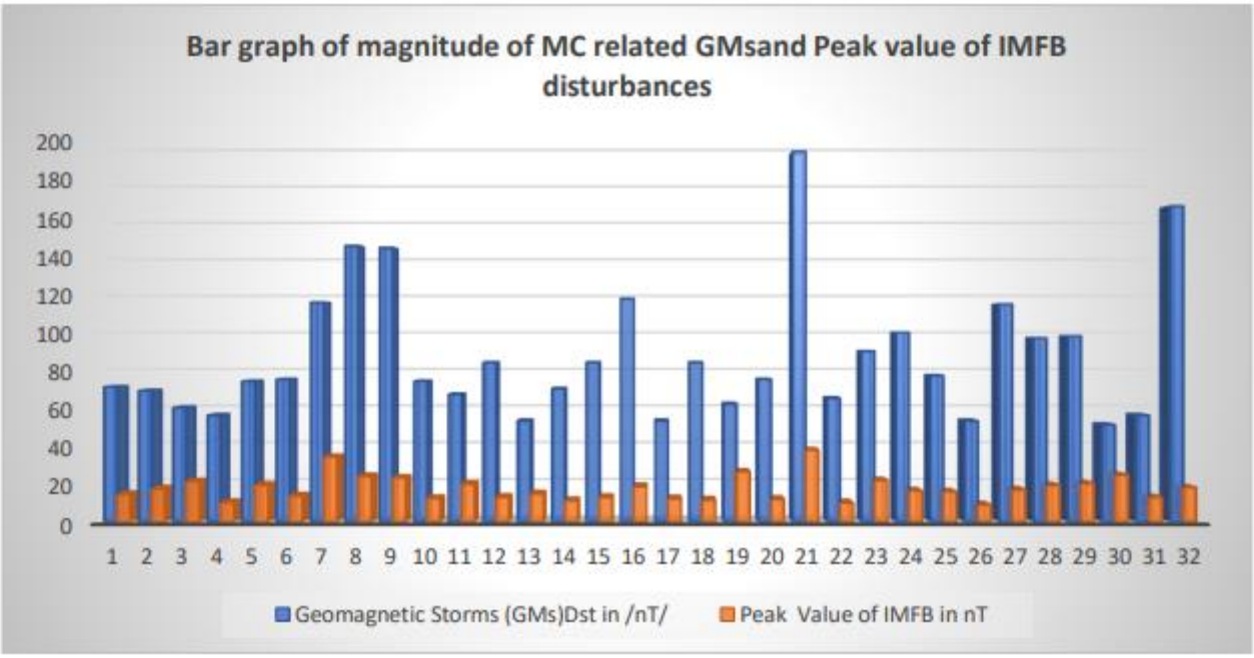

Figure -1-Shows bar graph of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of interplanetary magnetic fields (IMF) disturbances events during solar cycle 23 and 24.

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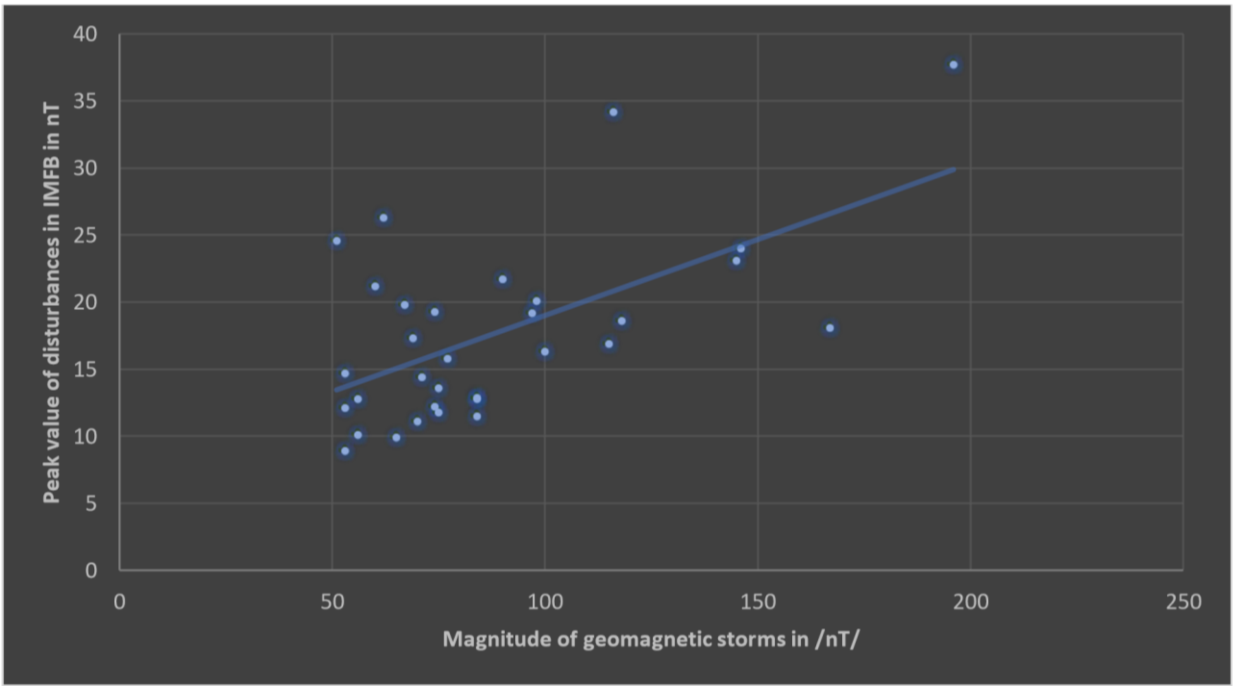

Figure -2-Shows scatter plot between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of interplanetary magnetic fields (IMF) disturbances events during solar cycle 23 and 24.

2.2-Correlation between magnitude of good quality MC related geomagnetic storms and peak value of disturbances in southward components of interplanetary magnetic fields (IMFBz) during solar cycle 23 and 24

From the data scrutiny of magnetic cloud related geomagnetic storms and associated disturbances in southward component of interplanetary magnetic fields (IMFBz) listed in table, it is detected that all the good quality magnetic cloud related geomagnetic storms are allied with disturbances in southward component of interplanetary magnetic fields (IMFBz) and from the crucial examination of hourly value of disturbances in IMFBz and geomagnetic storms it realized that the onset of good quality related geomagnetic storms starts after few hours to more than a few hours to the beginning time of disturbances in IMFBz. To distinguish the statistical behavior of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of associated disturbances in southward component of interplanetary magnetic fields (IMFBz) and also to perceive that how the magnitudes of good quality magnetic cloud related geomagnetic storms are correlated with peak value of IMFBz events, we have strategized a bar diagram in figure 3 and a scatter plot between the magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in southward constituent of interplanetary magnetic fields events in figure 4. It is clear from the bar illustration that most of the good quality magnetic cloud related geomagnetic storms which have large storm magnitude are linked with such disturbances in IMFBz events which have large peak value. Further from the crucial examination of the trend line of scatter plot shown in figure 4 ,it is observed that the trend line of the scatter plot shows strong positive correlation between good quality magnetic cloud related geomagnetic storms and peak value of allied disturbances in southward component of interplanetary magnetic fields (IMFBz). Strong positive correlation with correlation coefficient 0.67 has been calculated by numerical method between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of IMFBz disturbances during solar cycle 23 and 24.

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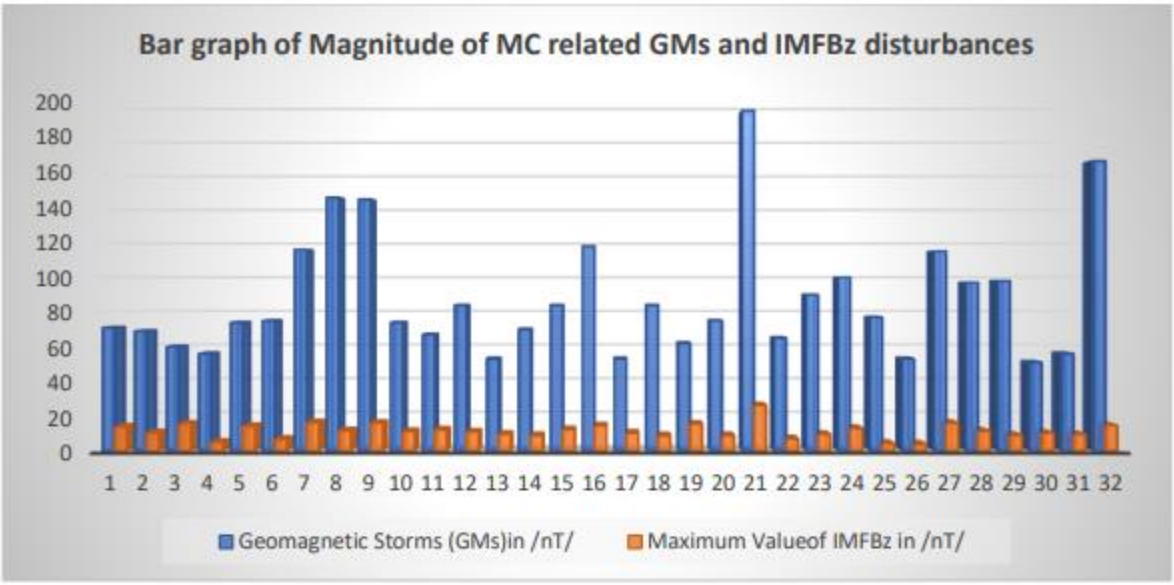

Figure -3-Shows bar graph of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of southward component interplanetary magnetic fields (IMFBz) disturbances events during solar cycle 23 and 24.

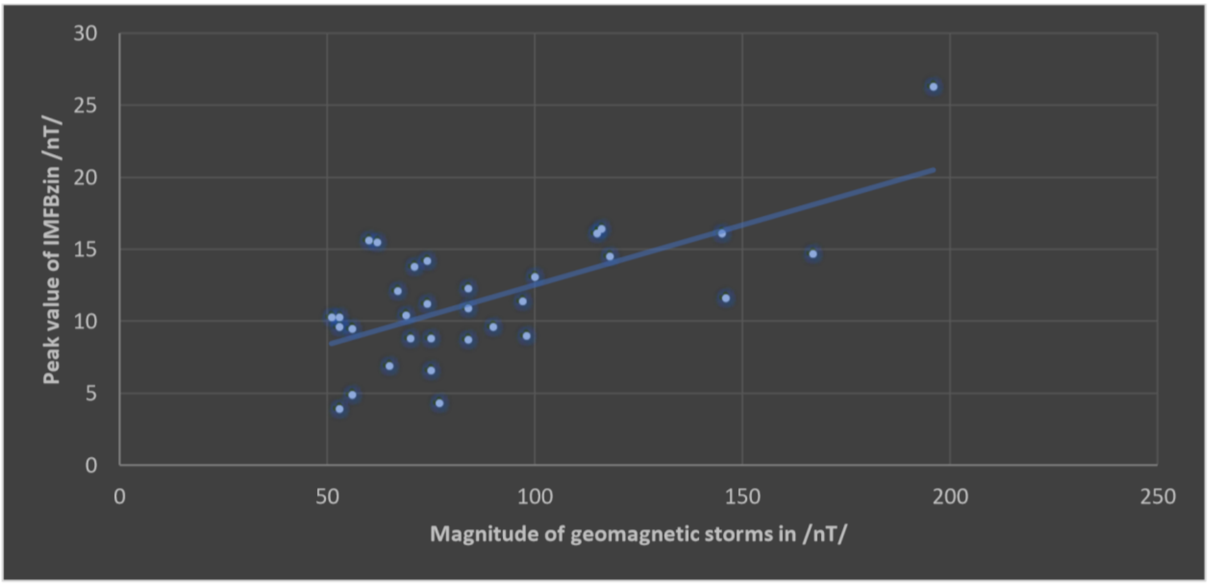

Figure -4-Shows scatter plot of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of southward component interplanetary magnetic fields (IMFBz) disturbances events during solar cycle 23 and 24.

2.3-Correlation between magnitude of good quality MC related geomagnetic storms and peak value of disturbances in solar wind plasma temperature
(SWPT) during solar cycle 23 and 24

From the data analysis of good quality MC related geomagnetic storms and connected disturbances in solar wind plasma temperature (SWPT) listed in table, it is detected that all the good quality magnetic cloud related geomagnetic storms are associated with disturbances in solar wind plasma temperature (SWPT) and from the crucial examination of hourly value of disturbances in SWPT and geomagnetic storms it understood that the onset of good quality MC related geomagnetic storms starts after few hours to several

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hours to the beginning time of disturbances in SWPT. To know the arithmetical behavior of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of allied disturbances in solar wind plasma temperature (SWPT) and also to understand that how the magnitudes of good quality magnetic cloud related geomagnetic storms are correlated with peak value of disturbances in solar wind plasma temperature (SWPT) events, we have strategized a scatter plot between the magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma temperature (SWPT) events in figure 5. It is clear from the bar illustration that most of the good quality magnetic cloud related geomagnetic storms which have large storm magnitude are allied with such disturbances in solar wind plasma temperature (SWPT) events which have large peak value, but the magnitude and peak value of these two events do not have any fixed proportion, we have found some good quality magnetic cloud related geomagnetic storms which have large magnitude but they are linked with such disturbances in solar wind plasma temperature (SWPT) events which have small peak value and vice versa .These outcomes shows that though these events do not have any measurable relation but the good quality magnetic cloud related geomagnetic storms of higher magnitude is normally related with such disturbances in solar wind plasma temperature (SWPT) events which have reasonably higher peak values. Further from the crucial examination of the trend line of scatter plot shown in figure 5, it is detected that the trend line of the scatter plot shows positive correlation between good quality magnetic cloud related geomagnetic storms and peak value of connected disturbances in solar wind plasma temperature (SWPT). Positive correlation with correlation coefficient 0.54 has been premeditated by arithmetical method between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of allied disturbances in solar wind plasma temperature (SWPT) during solar cycle 23 and 24.

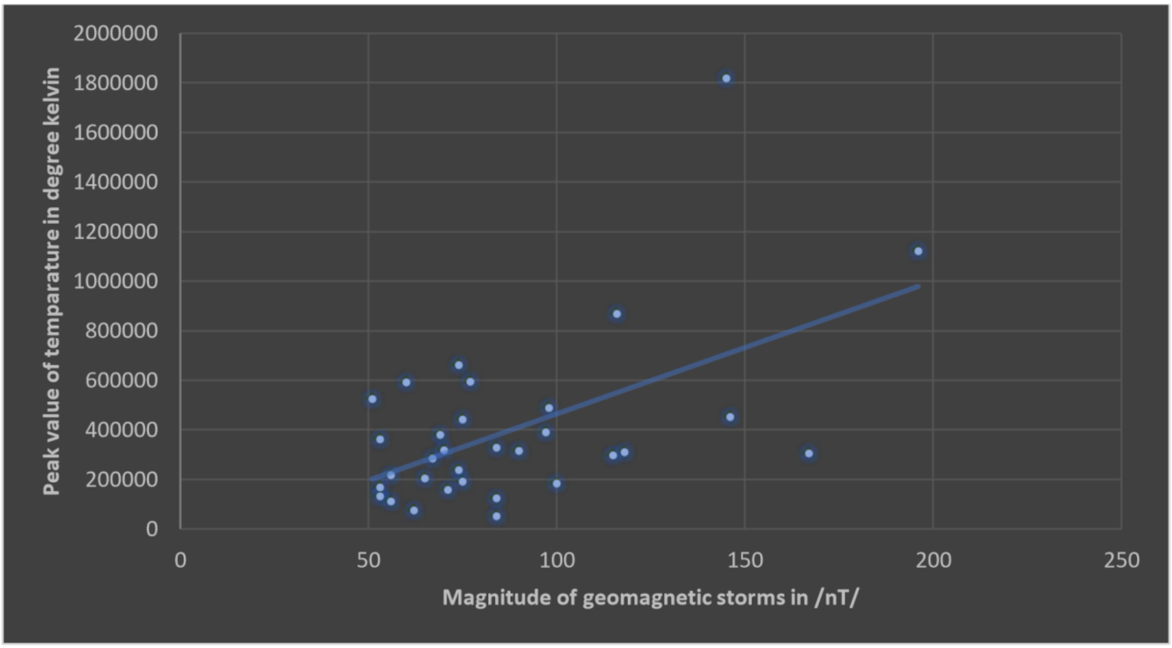

Figure -5-Shows scatter plot of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma temperature (SWPT) events during solar cycle 23 and 24.

2.4-Correlation between magnitude of good quality MC related geomagnetic storms and peak value of disturbances in solar wind plasma density (SWPD) during solar cycle 23 and 24

From the data examination of magnetic cloud related geomagnetic storms and associated disturbances in solar wind plasma density temperature (SWPD) listed in table, it is observed that all the good quality magnetic cloud related geomagnetic storms are linked with disturbances in solar wind plasma density (SWPD) and from the crucial scrutiny of hourly value of disturbances in SWPD and geomagnetic storms it understood that the onset of good quality related geomagnetic storms starts after few hours to more than a few hours to the beginning time of disturbances in SWPD. To distinguish the numerical conduct of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of allied disturbances in solar wind plasma density (SWPD) and also to see that how the magnitudes of good quality magnetic cloud related geomagnetic storms are correlated with peak value of disturbances in solar wind plasma density (SWPD) events, we have conspired a bar illustration and a scatter plot between the magnitude of good quality magnetic cloud connected geomagnetic storms and peak value of disturbances in solar wind plasma density (SWPD) events in figure 6 and figure 7. It is clear from the bar figure that most of the good quality magnetic cloud related geomagnetic storms which have large storm magnitude are associated with such disturbances in solar wind plasma density (SWPD) events which have large peak value, but the magnitude and peak value of these two events do not have any fixed proportion, we have originate some good quality magnetic cloud related geomagnetic storms which have large magnitude but they are accompanying with such disturbances in solar wind plasma density (SWPD) events which have small peak value and vice versa .These consequences designates that although these events do not have any quantifiable relation but the good quality magnetic cloud related geomagnetic storms of higher magnitude is generally related with such disturbances in solar wind plasma density (SWPD) events which have relatively higher peak values. Further from the crucial inspection of the trend line of scatter plot shown in figure 7 ,it is observed that the trend line of the scatter plot shows positive correlation between good quality magnetic cloud related geomagnetic storms and peak value of linked disturbances in solar wind plasma density (SWPD). Positive correlation with correlation coefficient 0.27 has been premeditated by statistical method between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of associated disturbances in solar wind plasma density (SWPD) during solar cycle 23 and 24.

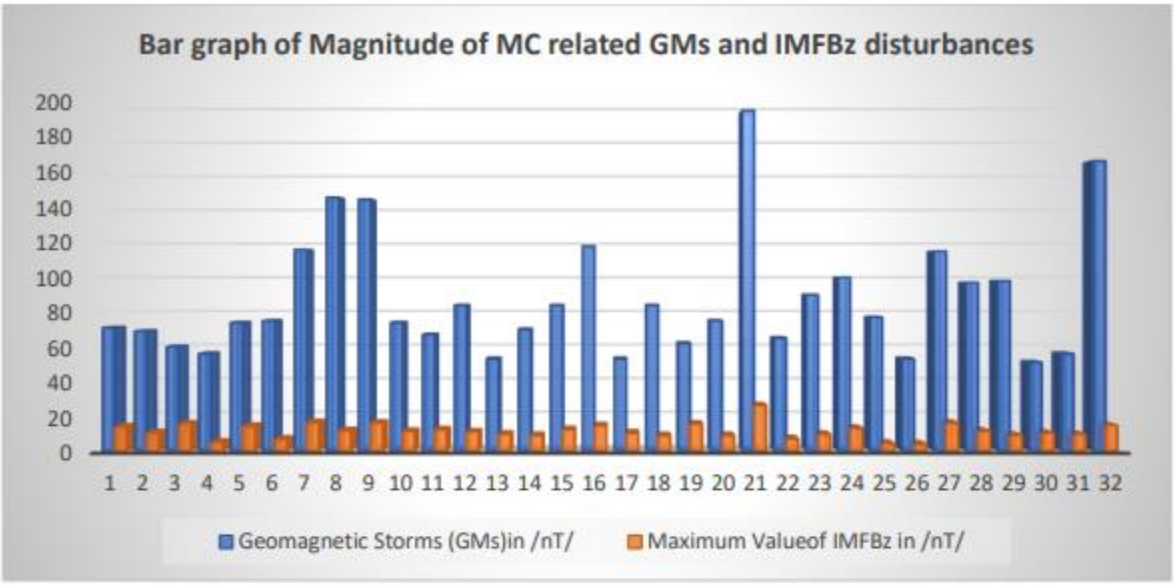

Figure -6-Shows bar diagram of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma density (SWPD) events during solar cycle 23 and 24.

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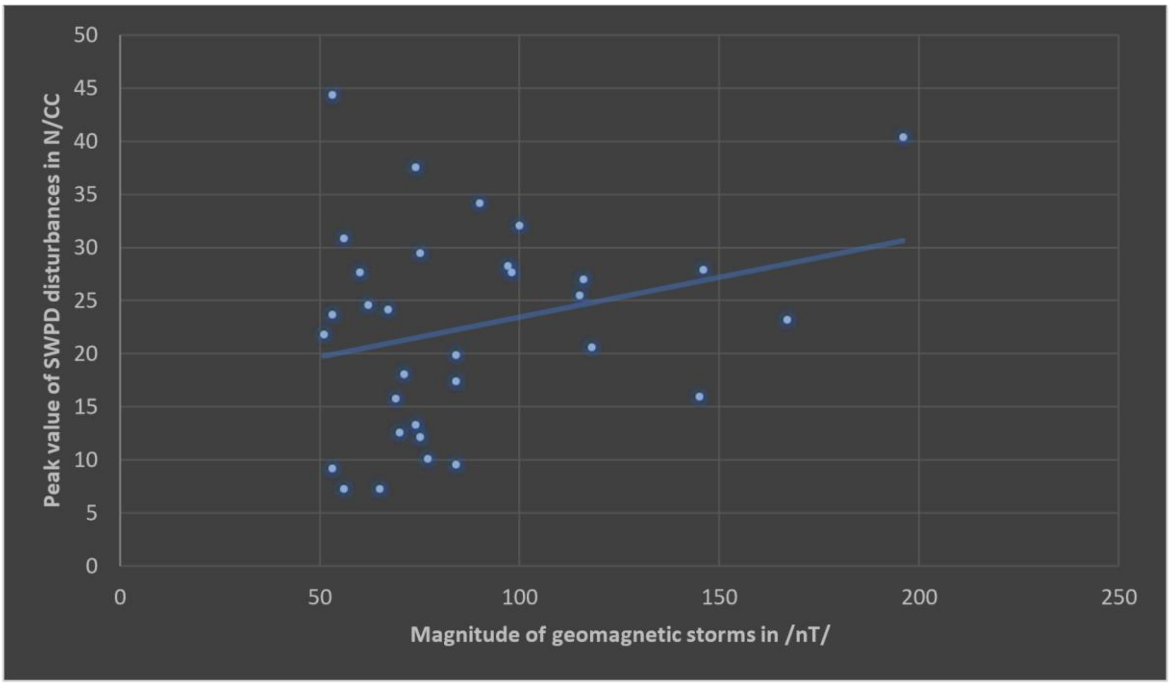

Figure -7-Shows scatter plot between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma density (SWPD) events during solar cycle 23 and 24.

2.5--Correlation between magnitude of good quality MC related geomagnetic storms and peak value of disturbances in solar wind plasma velocity (SWPV) during solar cycle 23 and 24

From the data investigation of magnetic cloud interrelated geomagnetic storms and allied disturbances in solar wind plasma velocity (SWPV) listed in table, it is detected that all the good quality magnetic cloud related geomagnetic storms are allied with disturbances in solar wind plasma velocity (SWPV) and from the crucial examination of hourly value of disturbances in SWPV and geomagnetic storms it seen that the onset of good quality related geomagnetic storms starts after few hours to several hours to the beginning time of disturbances in SWPV .To distinguish the geometric performance of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of connected disturbances in solar wind plasma velocity (SWPV) and also to understand that how the magnitudes of good quality magnetic cloud related geomagnetic storms are correlated with peak value of disturbances in solar wind plasma velocity

(SWPV) events, we have conspired a bar illustration and a scatter plot between the magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma velocity (SWPV) events in figure 8 and figure 9. It is clear from the bar illustration that most of the good quality magnetic cloud related geomagnetic storms which have large storm magnitude are accompanying with such disturbances in solar wind plasma velocity (SWPV) events which have large peak value, but the magnitude and peak value of these two events do not have any fixed proportion, we have originate some good quality magnetic cloud related geomagnetic storms which have large magnitude but they are allied with such disturbances in solar wind plasma velocity (SWPV) events which have small peak value and some good quality magnetic cloud related geomagnetic storms which have small magnitude but they are linked with such disturbances in solar wind plasma velocity (SWPV) events having large peak values. These results designate that though these events do not have any measurable relation but the good quality magnetic cloud connected geomagnetic storms of higher magnitude is usually connected with such disturbances in solar wind plasma velocity (SWPV) events which have relatively higher peak values. Additionally from the crucial examination of the trend line of scatter plot shown in figure 9 ,it is observed that the trend line of the scatter plot shows positive correlation between good quality magnetic cloud related geomagnetic storms and peak value of associated disturbances in solar wind plasma velocity (SWPV). Positive correlation with correlation coefficient 0.40 has been calculated by arithmetical method between magnitude of good quality magnetic cloud linked geomagnetic storms and peak value of allied disturbances in solar wind plasma velocity (SWPV) **Figure -8-**

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Shows bar diagram of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma velocity (SWPV) events during solar cycle 23 and 24.

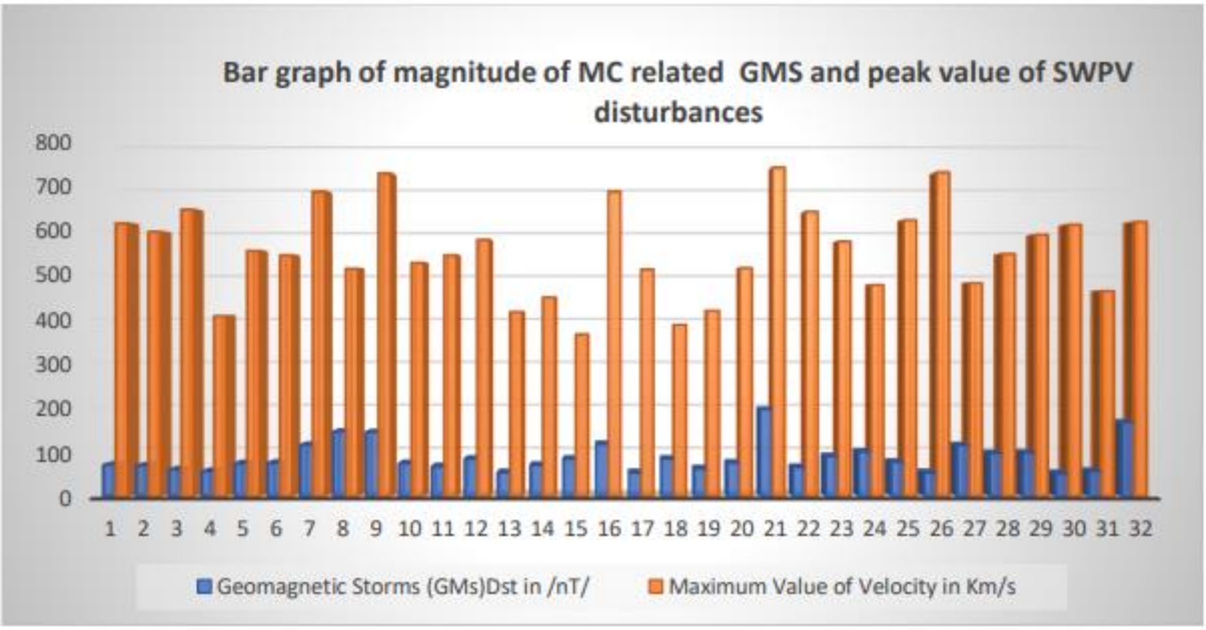

Figure -8-Shows bar diagram of magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma velocity (SWPV) events during solar cycle 23 and 24.

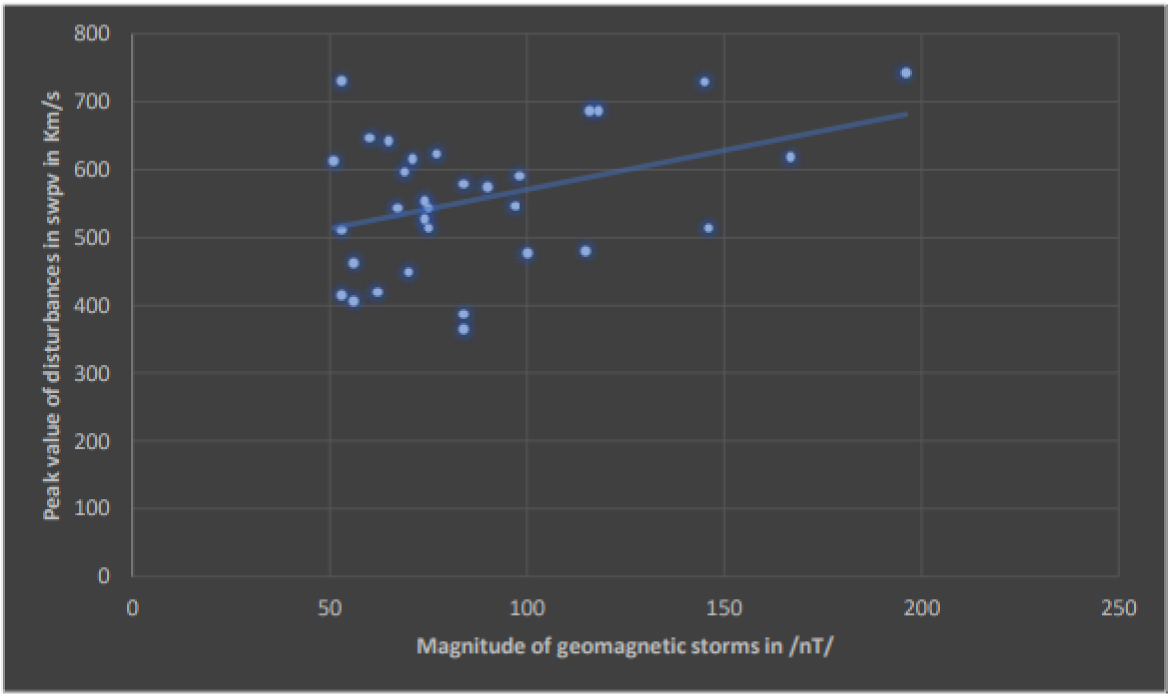

Figure -9-Shows scatter plot between magnitude of good quality magnetic cloud related geomagnetic storms and peak value of disturbances in solar wind plasma velocity (SWPV) events during solar cycle 23 and 24.

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3.0-MAIN RESULTS

We have analyzed magnetic cloud related geomagnetic storms observed during the period of solar cycle 23 and 24 with disturbances in solar wind plasma parameters.

We have observed that the magnitude of geomagnetic storms is well correlated with peak disturbances values of solar wind plasma parameters solar wind plasma velocity (SWPV), solar wind plasma density (SWPD), solar wind plasma temperature (SWPT), interplanetary magnetic fields (IMFB) and southward component of interplanetary magnetic fields (IMFBz).The important results are as follows .

1-All the good quality magnetic cloud related geomagnetic storms are found to be associated with disturbances in solar wind plasma parameters.

2-The onset of good quality magnetic cloud related geomagnetic storms are found few hours to several hours after the beginning time of disturbances in solar wind plasma parameters.

3-Large positive correlation with correlation coefficient 0.60 have found between magnitude of GMS and peak value of associated disturbances in IMFB which shows close connection between the occurrences of geomagnetic storms and disturbances in interplanetary magnetic fields, 4-large positive correlation with correlation coefficient 0.67 have been obtained between magnitude of geomagnetic storms and peak value of associated disturbances in IMFBz.This result shows southward component of interplanetary magnetic fields play fundamental role to generate geomagnetic storms in geomagnetosphre.

5- Positive correlations with correlation coefficient 0.54 have been found between magnitude of GMS and peak value of associated disturbances in solar wind plasma temperature. The obtained result shows that disturbances in solar wind plasma temperature may be one of the factors for geomagnetic field disturbances.

6-Positive correlation with correlation coefficient 0.40 has been calculated between magnitude of geomagnetic storms and peak value of associated disturbances in solar wind plasma velocity this shows that disturbances in solar wind plasma velocity is also important factor to cause geomagnetic storms.

7-Positive correlation with correlation coefficient 0.27 has been found between magnitude of good quality related geomagnetic storms and peak value of disturbances in soar wind plasma density and hence, disturbances in solar wind plasma density also contribute in the occurrences of geomagnetic storms.

4.0-CONCLUSIONS

In the present paper we used the correlation analysis method to know the behavior of disturbances in solar wind plasma parameters with the good quality magnetic cloud related geomagnetic storms in earth magnetosphere observed during the period of solar cycle 23 and 24. We obtained 32 good quality magnetic cloud related geomagnetic storms for the period of solar cycle 23 and 24. The results show that disturbances in solar wind plasma velocity, plasma density, plasma temperature interplanetary magnetic fields and southward component of interplanetary magnetic fields interplanetary magnetic field start to increase some hours before the initial and onset time of geomagnetic storms which is in good agreement with results of other authors (Gonzalez et al., 1994; Crooker and Cliver, 1994; Gonzalez et al., 1999). The onset of the geomagnetic storms begins when the enhanced IMF rotates southward. The fact that disturbances produced by solar wind plasma parameters in the ambient magnetic field is key factor for geomagnetic storm generation is in good agreement with results by other authors (Tsurutani et al., 1995; Crooker and Cliver, 1994; Farrugia et al., 1997).One of the most important finding of this study is that from the crucial investigation of hourly data of Dst ,solar wind plasma velocity,density,temperature interplanetary magnetic fields and southward component of interplanetary magnetic fields ,we obtained that biggening of disturbances in solar wind plasma parameter have been seen before several hours of onset time of geomagnetic storms which might be an important factor in space weather forecast.

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