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CORRELATIVE STUDY OF GEOMAGNETIC STROMS WITH SUN-SPOT NUMBERS IN SOLAR CYCLE 23

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ABSTRACT

Stars are large scale magnetized plasma structures originating from closed magnetic field regions on the sun and are the most energetic solar events in which vast amount of solar plasma materials are expelled from the solar corona into interplanetary space. Geomagnetic storms in a major component of space weather and provide the impact for many other components of space weather. In present study, correlation between sunspot number to classified Geomagnetic storms are 0.75 for SSN to moderate 0.35 for SSN to super and 0.81 for SSN to intense GMS. So we have concluded that good correlation between SSN and intense GMS but general correlation between SSN and super GMS.

KEY WODRS: Geomagnetic storms, Sunspot numbers, interplanetary medium and Coronal mass ejection

A geomagnetic storms defined by changes in the Dst (disturbance storms time) index. The dst index estimates the globally averaged change of the horizontal component of the earth's magnetic field at the magnetic equator based on measurements from a few magnetometer stations (Firoz et al., 2009). A geomagnetic storms is caused by a solar wind shock wave and or cloud of magnetic field with interacts with the Earth's magnetic field, (Gonzalez et al., 1994). During the main phase of geomagnetic storms, electric current in magnetosphere create magnetic force which pushes out the boundary between the magnetosphere and the solar wind. The disturbance in the interplanetary medium which drives the geomagnetic storms may be due to a solar coronal mass ejection (CME) or a high speed storms (Co rotating interaction region or CRI) of the solar wind originating from a region of weak magnetic field on the sun's surface. (Rathore et al., 2011 and Guimingle et al., 2012)

By Loowe & Pollse Dst index are classified in four categories.

Weak storms	Dst > -50 nT
Moderate storms	-100nT < Dst ≤ -50nT
Intense storms	-200nT < Dst ≤ -100nT
Super storms	Dst ≤ -200nT.

DATA ANALYSIS

Sunspot numbers and Dst daily data have been used over the period 1996 to 2008 to determine on set time magnitude of geomagnetic storms. This data has been taken from the NSSDC omni web data system. The data of SSN have been taken from SOHO- large angle spectrometric.

RESULTS AND CONCLUSION

We count Geomagnetic storms (GMS) by daily average value during 1996 to 2008 in solar cycle 23. In table 1, shows yearly average value of Sunspot numbers (SSNs) from 1996 to 2008. In it, clear that SSNs is arising from 1996 to 1999 and maximum in year 2000 and again decline up to 2008. The peak value of SSNs in year 2000 is 120, which is maxima of solar cycle 23, from same table 1, we have also find 223 total GMS in solar cycle 23. We have classified GMS with their Dst magnitude. With their classification as per year under the selection criteria 184 moderate GMS, 34 Intense GMS and 4 Super GMS have been occurred (Kaushik ,2005). Maximum number of events (37 GMS) occurred in year 2002. Large numbers of GMS occurred during 2001 to 2005, which is shown in fig 1.

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Table 1:Daily average SSNs and Dst number's from 1996 to 2008

Years	Rz	Moderate	Intense	Super	Total GMS
1996	9	2			2
1997	22	10			10
1998	64	18	4		22
1999	93	13	1		14
2000	120	24	5		29
2001	111	24	9	2	35
2002	104	31	6		37
2003	64	15	5	1	21
2004	40	15	4	1	20
2005	30	29	1		30
2006	15	3	0		13
2007	7	0	0		0
2008	3	0	0		0
		184	35	4	223

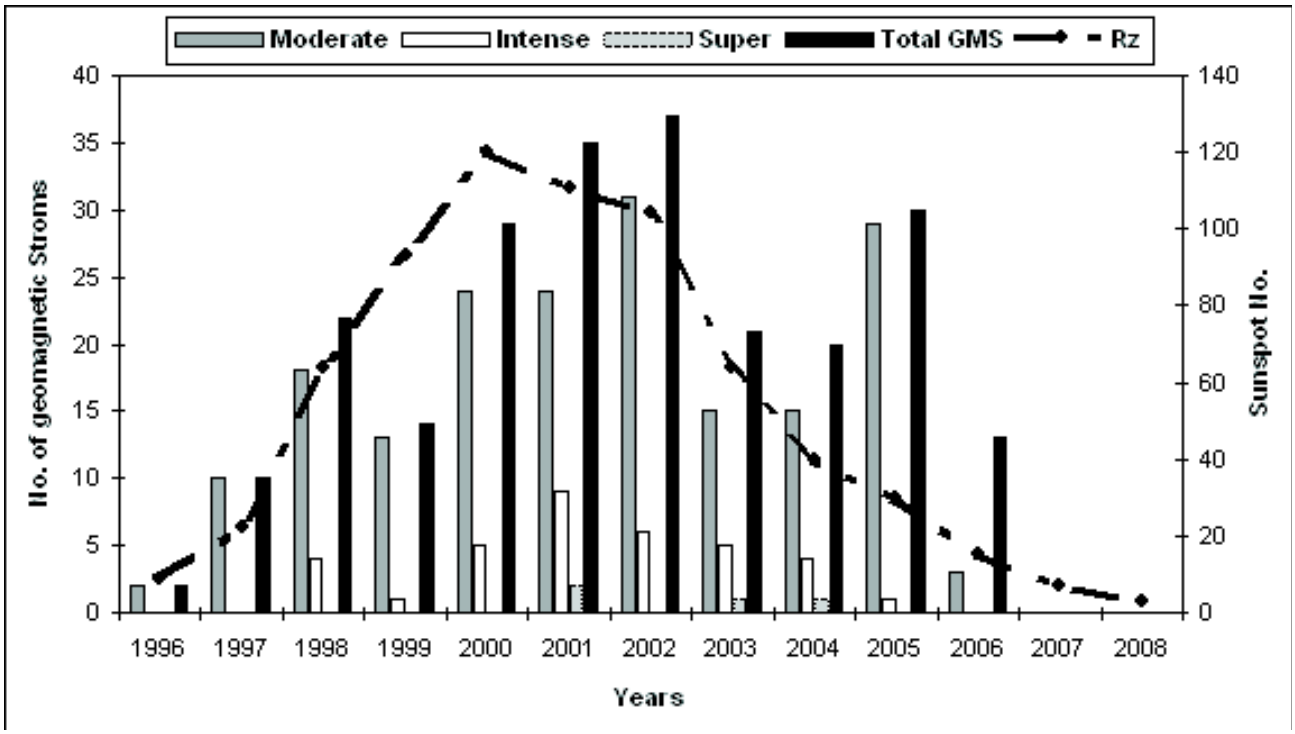

Figure 1: Shows curve between sunspot numbers and Geomagnetic Storms (GMS) classified three Dst range from 1996 to 2008 in solar cycle 23

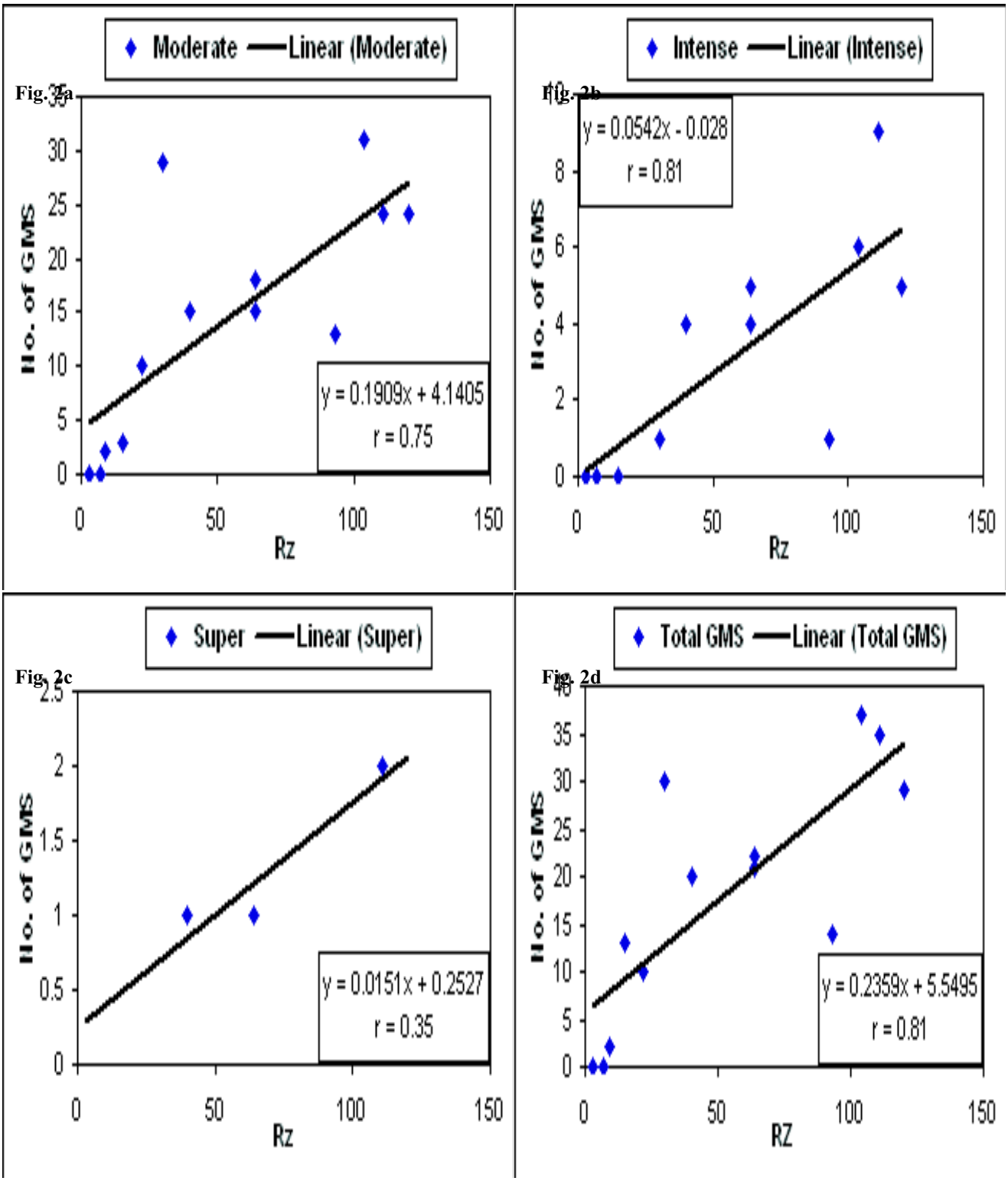

Fig. 2a Fig. 2b Fig. 2c Fig. 2d

Figure 2 (a, b, c, d): Shows scattered curve between number of GMS to Sunspot number whose co-relation coefficient find out from 1996 to 2008 in solar cycle 23

Fig 2 (a, b, c, d) shows the correlative curve between sunspot numbers and different types of GMS. In which maximum co-relation occurs between SSN and Intense GMS (r = 0.81), which is a good co-relation.

From the study there are following conclusion occurs:

I. 64 % Moderate GMS are found in year 2001 to 2006, which is declining phase of solar cycle 23.

II. 79 % Intense GMS are found in year 2001 to 2006, which is declining phase of solar cycle 23.

III. 100 % Super GMS are found in year 2001 to 2006, which is declining phase of solar cycle 23.

IV. At the end of solar cycle 23 from 2007 & 2008, no any types of GMS are found.

V. The correlation between SSN to Moderate GMS is 0.75, between SSN to Intense GMS is 0.81 & between SSN to Super GMS is 0.35.

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REFERENCES

Firoz K.A., Kumarphani D.V. and Choks C. ,2009. On the relationship of CRI with solar interplanetary and geophysical parameters. Astrophysics Space Science, **325** (2) :185-193.

Gonzalez W.D., Toselga J.A., Kamide Y., Kioehl H.W., Rostogi G., Tsurutani B.T. and Vasyliunas V.M. ,1994.What is a Geomagnetic storms. Journal of Geophysics. Res., **99**:5771-5792.

Guimingle Z., Wang W.N.and Zhug Y.,2012.Solar cycle distribution of great geomagnetic storms. Astrophysics and Space Science, **339:**151-156.

Kaushik S.C., 2005.A study of intense geomagnetic storms and their associated solar & interplanetary causes Coronal and Steller mass ejections. Proc. IAU symposium, Cambridge University Press:454.

Rathore B.S, Kaushik S.C., Firoz D.C. ,Gupta A.K. ,Shrivastava K.K and Bhaduriya R.M ,2011.A correlative study of Geomagnetic storms associated with solar wind & IMF features during solar cycle 23.International Journal of applied physics and mathematics, **1** (2) : 15-20.