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ASSOCIATION OF SOLAR ACTIVITY WITH STORM TIME DISTURBANCE INDEX

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Abstract*: The solar and storm time disturbance index for the interval 1986 to 2006 have been analyzed. The Dst indices vary almost continuously with time period of minutes to days (short-term) and extending to 11 and 22 years (long-term). The yearly averages have been used to correlate understand the solar-terrestrial relationships. The analysis deals with the relation between long-term variation of solar parameters and Dst parameters. The combined use of solar and storm time disturbance index allows us to improve the variability of both the parameters. The analysis of data for 1986 to 2006 has revealed a good correlation between the storm time disturbance index during the period 1986 to 2006, spanning solar cycle 23 of solar activity.*

Keywords*: Solar parameters, storm time disturbance index.*

I. Introduction

The descending phase of the 23-rd solar cycle evolved into a quarry of extreme events on the bright manifestations of the Sun [1]. The solar activity burst in August-September 2005 appears to be the last one in the series of the significant event. Two extreme magnetic storms were registered on the 24 th – 25 th of August and 11 th -14 th of September 2005. In the first case, Kp-index of geomagnetic activity reached the value 9- and Dst index fall down to -216 nT [2-4]. The significant events on the Sun and in the heliosphere naturally modulated the galactic cosmic rays. Notably cosmic ray (CR) variations were observed during this time. In order to study these variations, the hourly characteristics of CR density and vector anisotropy derived by data of the neutron monitor network. Among the numerous effects in CR during both cases, three Forbush decreases are noticeable: 24 th - 25 th August (amplitude 6.4% for CR with rigidity 10 GV), 11 th of September (12.1%) and 15 th of September (5.1%). Contradictory to the situation in July 2005 [5], when powerful flares occurred on the western limb or behind the limb, the events of this considered period turned out to be much more geoeffective. In all these cases very fast shocks arrived at the Earth and their mean velocity exceeded [5-6].

II. Data and Methods

The disturb storm time index is taken from the world data centre service. The solar activity indices values are taken from the satellite data service of world data centre. Dst occur after every alternate day. To study the solar activity during storm time we have first calculated the annual averages of quite days as a reference of the storm month. With respect to that we have taken the deviation of solar activity of storm time and studied the relationship of both indices.

III. Observational Results

Figure 1.1(a) and 1.1(b) show the relationship between Rz and Dst for the solar cycles 22 and 23. Both the parameters Rz and Dst shows the inverse relationship and opposite variational profile. When Rz increases during high solar activity period, the Dst shows negative variation during the same period in both the solar cycles. The cross plot between Rz and Dst has been drawn for the solar cycles 22 and 23 [figure 1.1(c)] it is seen from the figure that both parameters Rz and Dst have opposite variactional profile during maxima phases of the solar cycles when Rz increases to its peak values same time the values of Dst are highly negative. However maxima of Rz dose not coincide with the minima of Dst the correlation coefficient ≈ -0.72

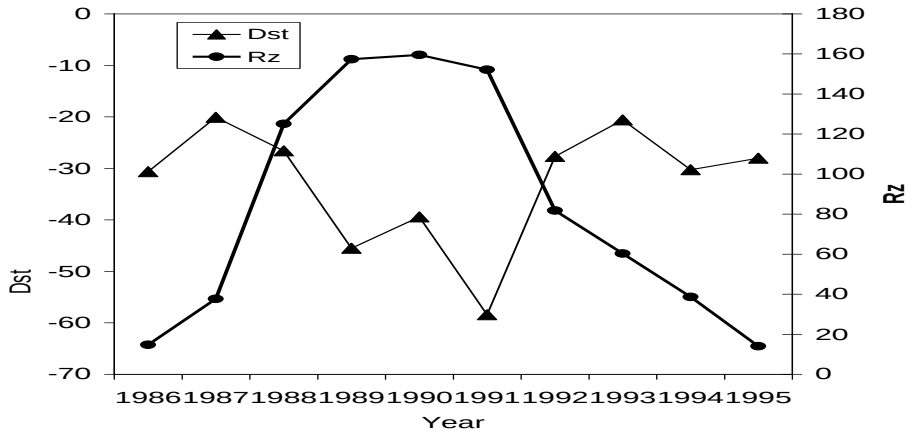

Figure 1.1(a) Shows the relationship between Rz and Dst for the solar cycle 22

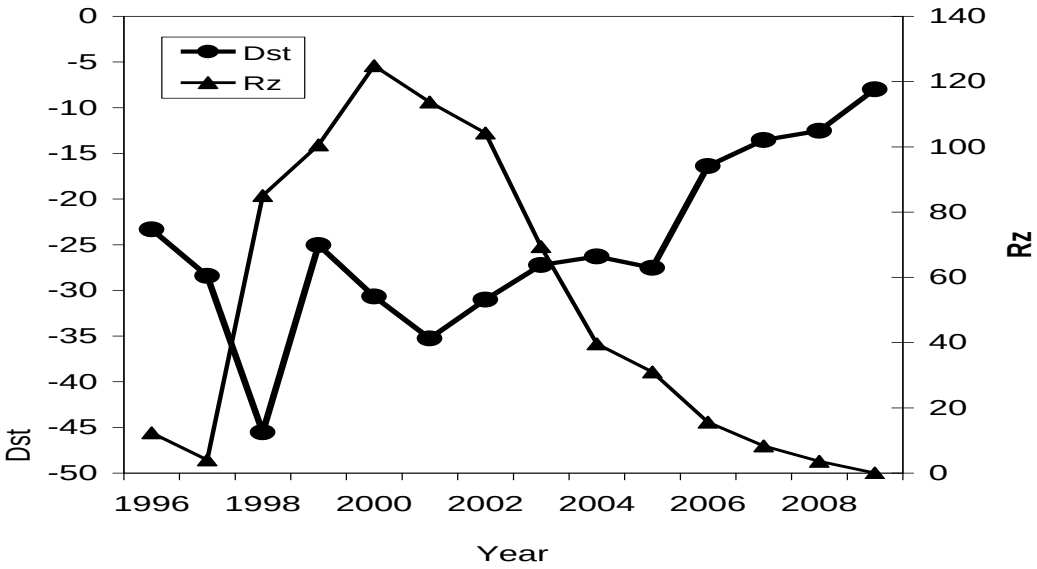

Figure 1.1(b) Shows the relationship between Rz and Dst for the solar cycle 23.

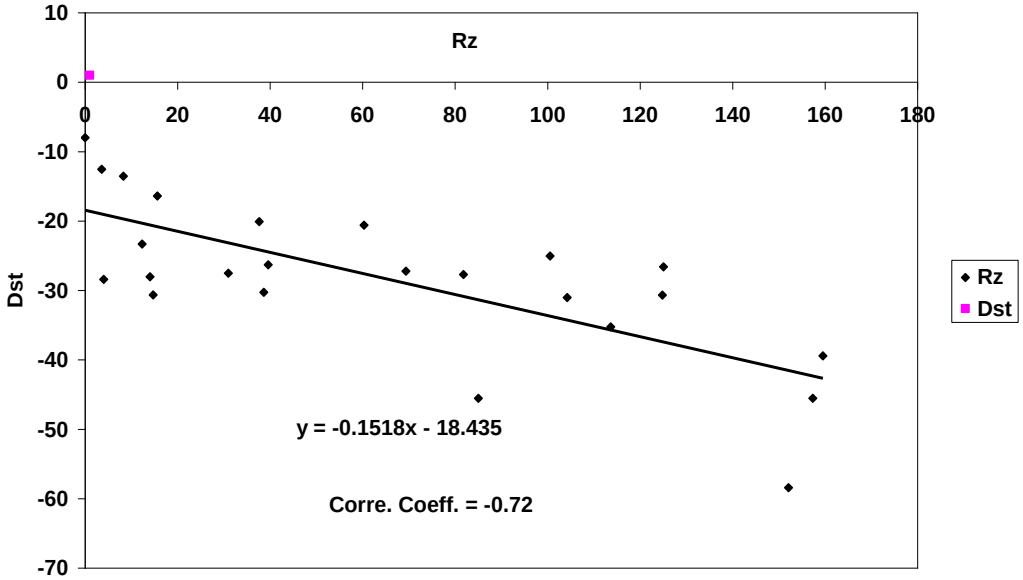

Figure 1.1(c) Shows the cross plot between Rz and Dst for the solar cycles 22 and 23.

IV. Discussion

The storm time index (Dst) is found highly negative during the maximum period of Rz for both the solar cycles 22 and 23. At a given time, the Dst index is the average of variation over all longitudes, the reference level is set so that Dst is sadistically disturbance, and an index of –200 or deeper is associated with middle-latitude auroras.

V. References

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