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LONG-TERM VARIABILITY OF INTERPLANETARY PLASMA AND FIELDS AS A LINK FOR SOLAR-TERRESTRIAL RELATIONSHIPS

Abstract content

Often the interplanetary parameters used for the study of solar-terrestrial relationships are solar wind speed (V), the total interplanetary magnetic field (B) and the southward component of IMF (Bz) measured by satellites and space probes. Both, hourly and daily values of these parameters have usually been employed to associate with parameters defining terrestrial effects. On a day-to-day basis, the product VB has recently been reported to be the most effective parameter yielding the highest correlation with cosmic rays and geomagnetic indices, even though earlier studies had either advocated for V, or some other combinations of various interplanetary indices. Moreover, it has been suggested that the degree of relationship differ for different phases of the solar activity cycle, and also from one cycle to another. As such, we have used the daily values of interplanetary indices (V, B and Bz), as well as the daily values of the geomagnetic disturbance index Ap, for a fairly long period of time from the year 1965 to 2006, covering almost four solar cycles (20, 21, 22 and 23). The long-term averages have been calculated for the days when simultaneous data is available for all the four parameters (V, B, Bz and Ap). Their yearly averages as well as averages on the basis of the phases of the solar activity cycle (such as minimum activity, ascending, maximum, and descending phase) have been obtained. The cross-correlations between them have been investigated on these long-term averages, as well as on the day-to- day basis. These sets have been further divided and studied on the basis of days with Bz being ≤ 0, or Bz > 0. The results so obtained can be summarized as: (1) the magnitudes of the values of Ap are observed to be always enhanced significantly for the case of Bz ≤ 0, as compared to days with Bz > 0, (ii) V vs Ap has always low values of correlation coefficient (r) both on the average basis, as well as on a day- to- day basis. (iii) on the contrary, B vs Ap has high values of 'r' both on a day-to-day basis, as well as on an average basis , (iv) nevertheless, the product VB vs Ap always yields much better correlations than for V or B, either on an average basis, or on a day- to- day basis, and (v) even though, the long-term variations of V are not very significant, the variation of B follows solar activity cycle and has a continuously increasing trend during the solar cycle 20 and 21. These conclusions will be discussed on the basis of the results reported earlier and on the basis of the theoretical models.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

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