Long -term Variability of Interplanetary Parameters and Their Impact on Geomagnetic Field

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The interplanetary parameters used for the study of solar-terrestrial relationships. Both, hourly and daily values of these parameters have usually been employed to associate with parameters defining terrestrial effects. For the reported study, we have used the daily average values of the interplanetary indices (V, B, Bz, T, and N), as well as that of the Ap index, for the years 1965 to 2009. The averages have been calculated by choosing only those days for which simultaneous data is available for all these parameters (V, B, Bz, T, N and Ap). These include their yearly averages as well as the averages on the basis of the phases of the solar activity cycle. The statistical relationship between them has been investigated on these long-term averages, as well as on the day-to-day basis. (i) V vs Ap has always low values of correlation coefficient (r). (ii) on the contrary, B vs Ap has high values of 'r', (iii) the product of V and B vs Ap always yields much better correlations than for V or B alone, either on an average basis, or on a day- to- day basis, and (iv) eventhough, the long-term variations of V are not very significant, the variations of B follow solar activity cycle and has a continuously increasing trend during the solar cycles 20 and 21. The statistical results obtained here signify that VB is the most effective parameter in producing large scale geomagnetic disturbances. Our results indicate very clearly that mostly neither V nor B is significantly effective in producing geomagnetic disturbances. Rather, we note from the result presented here that it is competing effects of B and V together, which are quite effective in producing large-scale geomagnetic disturbances. Such a deduction also implies that during more disturbed geomagnetic conditions (Ap >20), either V is dominant (B moderate / low), or B is dominant (while V is moderate) besides both of them being dominant.