

How good is the relationship of solar and interplanetary plasma parameters with geomagnetic storms?

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Since the work of Snyder et al. (1963) who showed a possible link between interplanetary solar wind speed V and geomagnetic index Kp, such a relationship has been examined by many workers and found to be rather loose. In the present communication, this relationship is rechecked for all data during 1973-2003. It was noted that moderate or strong geomagnetic storms occurred only when solar wind speed V was above ~350 km/s. However, above this limit, the plots of Dst versus V showed a large scatter, and any value of V could be associated with any value of Dst in a wide range of a factor of \sim 2, or any Dst value could be associated with any value of V in a wide range of a factor of ~2, indicating a poor relationship between V and Dst. The scatter could be partly because not V but VBs (product of V and the southward component Bs of interplanetary field B) is the appropriate variable relevant for Dst changes. This was checked. In the plot of Dst versus VBs, it was noticed that the scatter was smaller and correlation better than that in plot of Dst versus V. Since the relationship between V and Dst is poor, an estimate of V with some antecedence, as is done in a present-day prediction scheme (Gonzalez et al., 2004, V estimated from the lateral extension speed of side halo CMEs and assuming V² proportional to Dst magnitudes) is not likely to give reliable estimates of Dst magnitudes. However, estimate of V could certainly be useful to estimate the time when the storm would hit the Earth, but remembering that 15% of the halo CMEs may miss the Earth.