

Project Details

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Project Title:

An Assessment of the Feasibility of Predicting Major Geomagnetic Disturbances from Monitors in the Inner Heliosphere (0.5 AU)

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Summary:

A viable space weather tool must provide both timely and reliable predictions of major geomagnetic disturbances. Solar wind monitors positioned judiciously in orbit around the Sun at say ~ 0.5 AU are in principle capable of giving an advance warning of ~ 1.5 - 2.5 days of disruptive interplanetary configurations. However, it is crucial to ensure that the advantage of early warning be coupled with a knowledge of how these structures develop en route to 1 AU so as to be able to understand what properties these structures have when they reach Earth. Aside from a well-grounded knowledge of how the magnetosheath and the coupled magnetosphere-ionosphere system respond to various interplanetary triggers, an informed assessment presupposes improved further knowledge of the following: (a) correlation lengths (of both field and plasma) along the Sun-Earth line; (b) correlation lengths normal to the Sun-Earth line; (c) how interplanetary quantities known to correlate well with geomagnetic activity develop from 0.5 to 1 AU; (d) how (a) - (c) depend on the specific interplanetary configuration; and (e) on the system's history, i.e., whether the structures are transient or corotating; and (f) the number of monitors required to keep correlation values above a pre-assigned, able tolerance level.

For this proposed preliminary quantitative assessment there are extensive datasets which we shall use. The Helios 1 and 2 probes collected magnetic field and plasma data and data on particles of cosmic ray energies in the inner heliosphere (0.3 to 1.0 AU) during a major fraction of a solar cycle, with usable data for the purposes of this proposal from end of 1974 to mid-1981. Helios data will be supplemented by data from the IMP and ISEE 3 spacecraft which were, at least for a good fraction of the time, returning data from near Earth. Measurement of magnetospheric disturbances will be obtained from archived data.

Publication References:

Summary: no summary

Reference: Jordanova, V. K.; Kistler, L. M.; Farrugia, C. J.; Torbert, R. B.; (2001), Effects of inner magnetospheric convection on ring current dynamics: March 10-12, 1998, Journal of Geophysical Research, Volume 106, Issue A12, p. 29705-29720, doi: 10.1029/2001JA000047