

Project Details

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Project Title:

Prediction Techniques for Solar Energetic Particle Event Onsets

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Summary:

The aim of this work is to improve our ability to give advanced warning of solar energetic particle (SEP) events that are hazardous to humans in space. This is also the stated objective of the LWS Human Exploration and Development Enterprise. It is well established that solar energetic particles are caused by very high velocity Coronal Mass Ejections (CMEs). A severe problem for the prediction of the high energy particles is that they propagate from their source (the shock accompanying the CME) to the Earth in a matter of minutes. Thus it is insufficient to simply observe that a fast CME has taken place. By then it is too late to predict the SEP with a lead time that will allow avoidance actions to be carried out. Instead we must develop the ability to predict the initiation of fast CMEs with an adequate lead time. Previous studies have identified solar conditions that presage CME eruption without regard for velocities (flares, sigmoidal structures, emerging magnetic flux etc.), but no studies have been made that relate pre-eruptive conditions specifically to the velocities of the subsequent CMEs.

Using data in the public domain, we will carry out statistical studies of the relation of CME velocities to pre-eruption conditions. This will be the first study that systematically studies the indications that a high velocity CME is imminent. As the first study of this central problem for advanced warning of SEPs, we expect it to result in significant improvements in our forecasting capability.

Publication References:

no references