Award Abstract #2028492

AGS-PRF: An Observational-based Modeling Approach for Solar Energetic Particle Access to the Equatorial Inner Magnetosphere

NSF Org:	AGS Div Atmospheric & Geospace Sciences
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Investigator(s):	Rachael Filwett (Principal Investigator)
Sponsor:	Filwett, Rachael Iowa City, IA 52242-
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ABSTRACT

Many questions remain about how solar energetic particles (SEPs) interact with the geomagnetic field. These particles stream into the geomagnetic environment following explosive events, such as flares and coronal mass ejections from the Sun. Particles may become trapped in the geomagnetic field and the energy of these particles as well as the geospace environment, including current systems, affect how far they penetrate. This postdoctoral fellowship supports research on this topic, which is important to understanding space weather impacts to sensitive systems like satellites, which can be damaged by SEPs. In addition to supporting an early career scientist, this project includes the creation of a space weather demonstration that will be used in educational outreach events.

A comprehensive observational-based modeling approach will be employed to provide statistical insights into what processes affect SEP access into the geomagnetic field. The study utilizes 20 solar energetic particle events, which occur during a range of storm and non-storm conditions, from January 2013-December 2017, and which are measured with at least two satellites. Using a multi-spacecraft approach, the observations will be examined at a wide variety of radial distances, energies, and at a range of magnetic local times simultaneously. Utilizing the east-west directional flux anisotropy for solar protons observed in the inner-magnetosphere it is possible to measure particle cutoffs in the near-equatorial region. They will compare the energy and directional dependent cutoffs measured in-situ to the geomagnetic cutoffs calculated via the use of particle tracking models. Using the Tsyganenko 2005 particle tracing model they will determine which current systems contribute to suppressed geomagnetic cutoffs.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.