

Solar Energetic Particles, Solar Modulation and Space Radiation: New opportunities in the AMS Era #3

Contribution ID: 21

Type: **not specified**

The Role of Extensive Air Showers in the Inner Heliosphere

Tuesday 24 April 2018 14:00 (20 minutes)

Showers initiated by high-energy cosmic rays can inject secondary particles into interplanetary space. This will happen best if the primary particle arrives at an impact parameter such that the column mass corresponds to a nuclear interaction length. A tangential shower develops at this point in the atmosphere, and it will then project early secondary particles of all sorts in the immediate environment of the object. In the inner heliosphere we should see this process at work on Earth, Venus, and the Sun, which all have different cosmic-ray environments and physical properties. The Sun also generates its own high-energy particles, which indeed produce gamma-ray events detected by Fermi/LAT at GeV energies. The CRAND mechanism for Earth's and other planetary magnetospheres is well known, for example, as a related process. We consider the observability of tangential showers via gamma-ray or hard X-ray observations, such as those from Fermi and NuSTAR respectively, and predict the occurrence of extreme limb brightening as a consequence of these interactions.

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Session Classification: Early Tuesday Afternoon