Geophysical Research Abstracts
Vol. 14, EGU2012-10321, 2012
EGU General Assembly 2012

Multi-spacecraft observations of solar energetic particle events in the rising phase of solar cycle 24: Longitudinal and radial intensity gradients

D. Lario, E.C. Roelof, and G.C. Ho

The Johns Hopkins University, Applied Physics Laboratory, Laurel, MD 20723-6099, United States (david.lario@jhuapl.edu, 001 4437780386)

The current fleet of spacecraft spread throughout the inner heliosphere (i.e., STEREO-A, STEREO-B, ACE, SOHO, and MESSENGER) allows us to estimate the longitudinal and radial gradients in intensity of solar energetic particle (SEP) events during the rise of solar cycle 24. Simultaneous measurements of individual SEP events by two or more of the first four of the above spacecraft (all near 1 AU) allow us to infer the longitudinal gradient of SEP peak intensities. Distributions of the peak intensities for the events with identifiable solar origin are approximated by the form $\exp\left[-k(\phi-\phi_0)^2\right]$, where ϕ is the longitudinal separation between the parent active region and the footpoint of the field line connecting each spacecraft with the Sun, ϕ_0 is the distribution centroid and k determines the longitudinal gradient. Those events for which MESSENGER is nominally connected along the interplanetary magnetic field to one of the spacecraft near 1 AU allow us to infer a lower limit to the radial intensity gradient along magnetic field lines. During the decay phase of the events, periods of similar intensities are commonly observed by spacecraft well separated in longitude and, when connection to MESSENGER permits, by spacecraft along the same nominal interplanetary field line. Those periods of null intensity gradients are known as energetic particle reservoirs. Observations of radial and longitudinal intensity gradients as well as energetic particle reservoirs made by Helios during solar cycle 21 [Lario et al., ApJ, 653, 1531-1544, 2006] provide an important point of comparison.