Solar energetic particle events and elements of prediction

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Solar energetic particle (SEP) events constitute a significant component of the near Earth radiation environment and consist of protons, electrons, and heavier ions. Such events originate from particle acceleration in solar flares (SFs) and/or shocks associated with coronal mass ejections (CMEs). SEPs can last from a few hours to several days, and their relative composition varies by many orders of magnitude from event to event. They have a direct space weather impact on electronics and humans. For example, the survivability of a spacecraft is directly affected by the total energy deposited by the passage of energetic particles. Furthermore, SEP events are a major threat to human spaceflight outside the protective shield of the Earth's magnetosphere and pose a severe danger for aircrews and passengers on polar flights. Given the fact that only a small fraction of all solar flares and CMEs lead to SEP events the problem at hand becomes largely imbalanced. That said SEP prognosis is far from trivial. The scientific questions that one needs to address in such efforts are summarized as follows: *If we know the characteristics of the parent solar events, could the probability of SEP occurrence be reliably inferred, and how do the characteristics of SEP events (e.g., peak flux) map to the characteristics of their parent solar events?* In this talk elements of SEP prediction will be presented and critically assessed with a view to the future needs of human spaceflight efforts.

Ensemble self-reinforcement and strong memory effects for the anomalous transport of heterogeneous populations

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