Contribution ID: **102** Type: **Oral Presentation**

Energy losses and propagation times of solar energetic particles

Tuesday, 9 July 2019 11:40 (20 minutes)

The focused transport of solar energetic particles has received increasingly more interest in the last couple of years due to upcoming missions to the Sun. Stochastic differential equations offer a numerically robust way to model solar energetic particle events, but very few models exist which utilize the full capability of this approach. A step is taken towards this goal by solving the focused transport equation in the spatial dimension along the Parker magnetic field with stochastic differential equations. This model includes energy losses and can be used to study propagation times, topics which are somewhat unexplored within modelling due to limitations of the numerical schemes used. The effects of solar wind advection and energy losses upon observable characteristics of solar energetic particle events are explored and it is shown that the neglect of these processes would predict incorrect event onset times and peak intensities. Short propagation times and little energy losses are found for high energy particles, as expected. It is found that the average propagation time can be described by the diffusion approximation for cosmic rays, while an improved expression is derived for the average energy loss.

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Yes

Level for award
 (Hons, MSc,
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MSc

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Session Classification: Space Science

Track Classification: Track D2 - Space Science