



Connecting solar flare hard X-ray spectra to in-situ electron spectra using RHESSI and STEREO/SEPT observations

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In-situ observations of solar energetic particle events are determined by a combination of acceleration, injection, and transport processes which are often hard to disentangle. However, the energy spectrum of impulsive electron events is believed to carry the imprint of the flare acceleration process which can be studied by analyzing the hard X-ray (HXR) spectrum of the flare.

Using STEREO/SEPT electron data of the whole STEREO mission we have identified 64 solar energetic electron event candidates where the HXR solar counterpart of the event was observed by RHESSI. After cleaning of the data set and an independent verification by the timing of associated interplanetary type III radio bursts, we find 17 events which lend themselves for a comparison of the spectral indices observed in situ and at the Sun.

Special attention is paid to the choice of the in-situ electron spectral index used for comparison as most of the events show spectral transitions (breaks) in the measurement range of SEPT. We find that both the lower and higher spectral indices correlate similarly well with the HXR spectra yielding correlation coefficients of 0.8 but indicating opposite relations with the flare spectrum in terms of the thin- or thick target model. The correlations show no dependence on the electron onset delay, nor on the longitudinal separation between flare and spacecraft magnetic footpoint at the Sun. However, the correlations increase, if only events with significant anisotropy are used indicating that transport effects play a role in shaping the spectra observed in-situ. We will discuss the different transport effects that need to be taken into account and which may even lead to a vanishing imprint of the flare acceleration.