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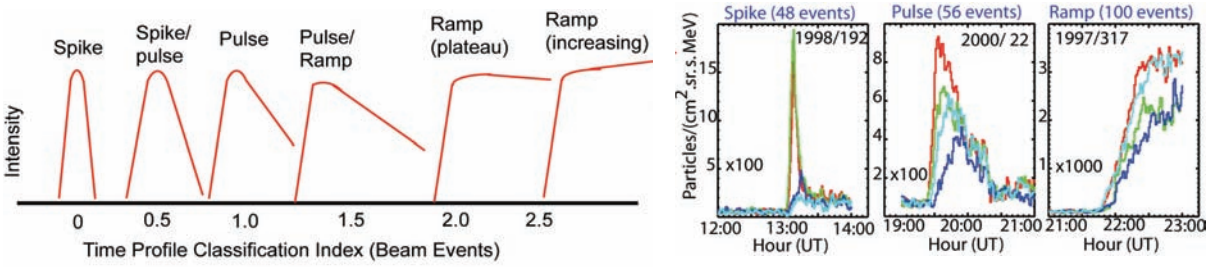
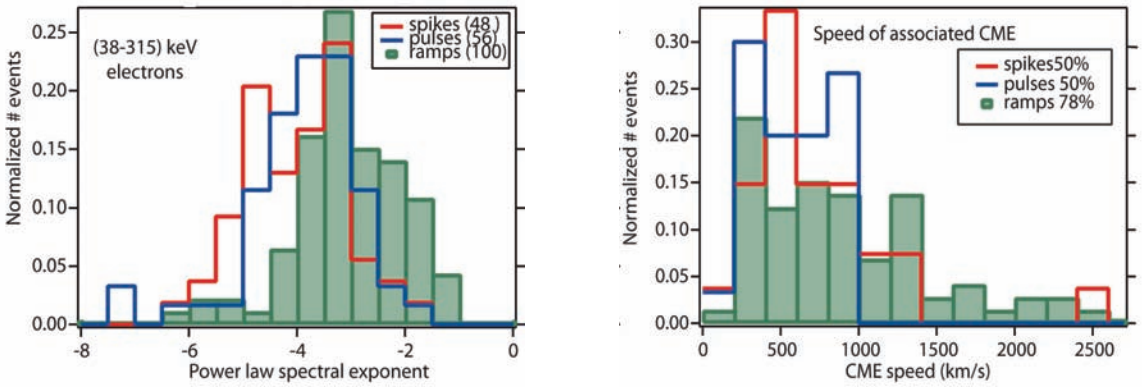
Classification of ACE/EPAM Near-Relativistic Electron Beam Events

The temporal profiles of highly anisotropic beam-like electron events observed at 1 AU form a continuum, from Gaussian "spikes" through intermediate "pulses" to long-lived "ramps". These classifications are quantified by assigning an index between 0 and 2.5 to each of the 204 electron beam events 38-315keV observed by ACE/EPAM (1997-2006).



An example of each type of event is shown above using 103-175 keV electrons. The colored traces indicate the intensity in four sunward look directions (LEMS30), so their degree of separation indicates the strength of the anisotropy. These field-aligned electron beams all have velocity-dispersed onsets, indicating that the solar injection of electrons began simultaneously. The classifications are assigned during the strongly anisotropic (approximately scatter-free) rise-to-maximum phase of the events, and therefore directly represent the first ~1/2 hour of the electron injection history at the Sun.



The spike and pulse events tend to have softer spectra compared to ramp events (whose median peak intensity is also ~3 times greater). Only 50% of spike and pulse events are associated with LASCO Coronal Mass Ejections (CMEs) *vs.* 78% of ramp events. The highest associated CME velocities (> 1500 km/s) occur almost exclusively with ramp events. Consequently, the acceleration/release mechanism for the longer lasting ramp events (perhaps CME-driven shock acceleration) may differ significantly from that of the much shorter duration spikes and pulses. The origin of the spike and pulse events is under study using detailed timing and intensity correlations with solar electromagnetic emission (*e.g.*, soft x-rays, microwave and type II and III radio bursts).

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