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Angular spread of solar energetic electrons observed by STEREO, ACE and SOHO

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Solar Energetic Particle (SEP) events sometimes exhibit large angular extents. The broadest angular spreads observed in large SEP events are commonly interpreted in terms of extended acceleration in a shock source which intercepts interplanetary magnetic field lines often separated by more than 100 degrees in longitude. By way of contrast, during impulsive flare-associated events the small spatial scale of the source typically leads to modest angular spread of energetic particles. In absence of shocks, the longitudinal spread of the particles has been attributed to lateral transport in the interplanetary medium or in the corona (e.g. Wibberenz and Cane, 2006) or to quickly diverging open magnetic field lines above the source active region (e.g. Klein et al., 2008). Such kind of processes could also operate during large gradual events with a significant flare contribution. We present multi-spacecraft observations of 55-425 keV electron events during the rising phase of solar cycle 24. With the aim of understanding the physical processes responsible for the large angular spread of the particles, we link the multi-point in-situ observations at 1 AU to the associated solar phenomena. The good observational coverage provided by the two STEREO spacecraft together with SOHO and ACE provides the opportunity to compare time profiles, onset times, anisotropies and spectra observed by different spacecraft, and to study their dependences with the angular separation of the spacecraft footpoints with respect to the source active region.