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Energetic particle injection deep into the inner magnetosphere: Van Allen Probes observations

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The Van Allen Probes mission measures the Earth's radiation belts with very high spatial, temporal, and energy resolution. Recent analysis has taken advantage of the capability of the ECT/MagEIS instrument's ability to directly measure penetrating background radiation contributions to the electron count rates - and subtract it - providing spectral measurements that are essentially free of background contamination [Claudepierre et al., 2014]. The "background-subtracted" measurements show a surprising lack of MeV electrons in inner zone of the radiation belt [Fennell et al., 2014]. However at energies below $\sim$1 MeV electrons can be injected through the slot region into the inner belt.

Our analysis of these deep particle injections shows (1) there is great variability in the location of the inner edge of the outer zone - both from one event to another and from one energy to another, (2) lower energy electrons (e.g. <300 keV) are injected into the inner zone (e.g. L<2) more often than higher energy electrons (3) electrons with energies as low as 50 keV are frequently injected into the inner zone. We discuss the implications of these new observations for our understanding of radiation belt acceleration and transport.