Electron Flux and Precipitation During ICME Case Studies

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Interplanetary coronal mass ejections (ICMEs) can dramatically affect electrons in the outer radiation belt. Electron energy flux and location varies over a range of timescales during these events, depending on ICME characteristics. This highly complex response means that electron flux within the outer radiation belt and precipitation into the upper atmosphere during ICMEs is not yet fully understood. This study analyses the electron response to two ICMEs, which occurred near the maximum of Solar Cycle 24. Both ICMEs had leading shocks and sheaths, followed by magnetic flux ropes in the ejecta. The magnetic field in these flux ropes rotated throughout the events, with opposite rotation in each event. The field rotated from south to north during the first event, while the second event had rotation from north to south. Data from Van Allen Probes were used to study electron flux variation in the outer radiation belt, while POES data were used for electron precipitation into the upper atmosphere. Qualitative analysis of these data was carried out in order to characterise the temporal and spatial variations in electron flux and precipitation throughout these two events, with particular focus on the effects of the sheath and rotating magnetic field in the ICME ejecta. In both events, we observe enhanced precipitation at mid-latitudes during the southward portion of the ejecta, with greater enhancements taking place in lower energy electron populations. By contrast, flux of outer radiation belt electron populations differs significantly between the two ICMEs, highlighting the complexity of the electron flux response to these space weather events.