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Magnetopause Shadowing Characteristics in Phase Space Density Measurements

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Loss mechanisms act independently or in unison to drive rapid loss of electrons in the radiation belts. Electrons may be lost by precipitation into the Earth's atmosphere, or through the magnetopause into interplanetary space. Whilst this magnetopause shadowing is well understood to produce dropouts in electron flux, it is less clear if shadowing continues to remove particles in tandem with electron acceleration processes, limiting the overall flux increase.

We investigate the contribution of shadowing to overall radiation belt fluxes throughout a geomagnetic storm in early September 2017. We use new, multi-spacecraft phase space density calculations to decipher electron dynamics during each storm phase and identify features of magnetopause shadowing during both the net-loss and the net-acceleration storm phases. We also highlight two distinct types of shadowing; 'Indirect', where electrons are lost through ULF wave driven radial transport towards the magnetopause boundary, and 'direct', where electrons are lost as their orbit intersects the magnetopause.