ENERGETIC ELECTRON PRECIPITATION DURING SUBSTORM INJECTION EVENTS: HIGH-LATITUDE FLUXES AND AN UNEXPECTED MIDLATITUDE SIGNATURE

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Geosynchronous Los Alamos National Laboratory (LANL-97A) satellite particle data, riometer data, and radio wave data recorded at high geomagnetic latitudes in the region south of Australia and New Zealand are used to perform the first complete modeling study of the effect of substorm electron precipitation fluxes on low-frequency radio wave propagation conditions associated with dispersionless substorm injection events. We find that the precipitated electron energy spectrum is consistent with an *e*-folding energy of 50 keV for energies <400 keV but also contains higher fluxes of electrons from 400 to 2000 keV. To reproduce the peak subionospheric radio wave absorption signatures seen at Casey (Australian Antarctic Division), and the peak riometer absorption observed at Macquarie Island, requires the precipitation of 50–90% of the peak fluxes observed by LANL-97A. Additionally, there is a concurrent and previously unreported substorm signature at $L < 2.8$, observed as a substorm-associated phase advance on radio waves propagating between Australia and New Zealand. We find that the most likely mechanism is the triggering of wave-induced electron precipitation caused by waves enhanced in the plasmasphere during the substorm and that either plasmaspheric hiss waves or electromagnetic ion cyclotron waves are a potential source capable of precipitating the type of high-energy electron spectrum required. However, the presence of these waves at such low *L* shells has not been confirmed in this study.

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