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Observations of relativistic electron precipitation from the radiation belts driven by EMIC waves

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Geomagnetic storms have been found to cause significant variations in trapped radiation belt relativistic electron fluxes, through a complex interplay between competing acceleration and loss mechanisms [*Reeves et al.*, 2003]. Understanding the loss of these relativistic electrons is a key to understanding the dynamics of the energetic radiation belts. A significant loss mechanism is Relativistic Electron Precipitation (REP) into the atmosphere. For some time theoretical modelling has shown that electromagnetic ion cyclotron (EMIC) waves should play an important role in the loss of relativistic electrons from the radiation belts, driving precipitation of extremely high-energy electrons. EMIC waves occur in the Pc1-Pc2 frequency range (0.1-5 Hz) and are generated near the magnetic equator by unstable distributions of ring current ions.

Up to now there has been limited experimental evidence for relativistic electron precipitation driven by EMIC waves. In this paper we present case studies of events showing EMIC waves, observed by ground-based pulsation magnetometers, which are linked to strong responses in a subionospheric precipitation monitor. This response is consistent with precipitation occurring near the plasmapause, where EMIC waves may resonate with relativistic electrons. At the same time there is only a weak response in a co-located riometer chain, as expected for relativistic electron precipitation that penetrates deeply into the atmosphere.