Radiation belt electron precipitation induced by large amplitude EMIC rising-tone emissions

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We study dynamics of radiation belt electrons interacting with large amplitude EMIC rising-tone emissions by performing test particle simulations. *Engebretson et al.* [JGR, 2015] reported observation of large amplitude EMIC rising-tone emissions outside the plasmasphere and depletion of radiation belt electrons in response to these emissions. We make the two kinds of wave models; one is in low-density region based on the observation and the other is in the plasmasphere. To reproduce the large wave amplitude we include the convective wave growth, which are neglected through propagation of EMIC model waves in the previous studies [*Omura and Zhao,* JGR, 2012, 2013; *Kubota et al.,* JGR, 2015]. Furthermore, we also include Landau damping in setting up the model waves. Comparing with a wave model ignoring the convective wave growth, it is found that the large wave amplitude contributes to rapid electron precipitation. Some of relativistic electrons change their equatorial pitch angles more than 15 degrees in a time scale of 0.1 s, precipitated into the atmosphere. We set up the EMIC model waves in a local longitude and distribute test electrons throughout all longitudinal direction initially. The electrons moving eastward encounter the localized EMIC waves and some of resonant electrons are precipitated into the atmosphere. We obtain distribution of radiation belt electrons with respect to their equatorial pitch angle and kinetic energy. We find that the frequency variation expands the resonant electron range of pitch angles and energies. For comparison with observation of precipitated electrons, we monitor fluxes of electrons lost into the atmosphere in a narrow longitudinal range. Furthermore, we find echo of electron depletion due to eastward drift around the Earth. Energy ranges of efficient precipitation are different depending on the regions of interaction inside and outside of the plasmapause. Inside the plasmapause, electrons with energy higher than 0.5 MeV are precipitated. Outside the plasmapause, on the other hand, only highly relativistic electrons with energy higher than 3 MeV are precipitated.