Abstract

Electron and proton periodic flux oscillations are a very common feature in the Earth's magnetosphere. They commonly appear after storm or substorm disturbances and are referred to as drift echoes. Here we show that they also appear as a result of the interaction of particles with broadband ULF waves and we investigate the relationship between the levels of electron flux oscillations and radial diffusion for different Phase Space Density (PSD) gradients. This is done through observation and particle tracing simulations under the effect of model Ultra Low Frequency (ULF) fluctuations. This investigation aims to demonstrate that electron flux oscillation is associated with and could be used as an indicator of ongoing radial diffusion. To this direction, flux oscillations are observed through the Van Allen Probes’ MagEIS and REPT energetic particle instruments; subsequently, flux oscillations are reproduced in a particle tracing model that simulates radial diffusion by using realistic magnetic and electric field fluctuations that are approximating field fluctuation measurements obtained by the the Van Allen Probes’ EMFISIS and EFW instruments, respectively. The flux oscillation amplitudes are then correlated with Phase Space Density gradients in the magnetosphere and with the ongoing radial diffusion process.