Effect of finite correlation time on the wave-particle interactions of nonlinear electrostatic structures with electrons in the Earth’s radiation belts.

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In situ measurements of electron scale fluctuations by the Van Allen Probes and MMS have demonstrated the ubiquitous occurrence of phase-space holes and various kinetic nonlinear structures in the Earth's magnetosphere. However it remains an open question whether phase-space holes have to be incorporated into global magnetospheric models describing the energisation and acceleration of electrons. In this communication we will review current wave-particle models of electron phase-space holes interacting with energetic electrons (e.g. >1 keV in the Earth's radiation belts) and present new theoretical results showing that finite correlation times of phase-space holes results in enhanced pitch-angle scattering. The pitch-angle scattering by phase-space holes is shown to be on par with that produced by chorus waves, and in some instances outgrows the chorus contribution.