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A study of full particle orbit effects in stochastic magnetic fields SHUN OGAWA, BENJAMIN CAMBON, XAVIER LEONCINI, Centre de Physique Theorique (CPT), CNRS, UMR7332, Aix-Marseille Universite, Universite de Toulon, DIEGO DEL-CASTILLO NEGRETE, Oak Ridge National Laboratory, MICHEL VITTOT, Centre de Physique Theorique (CPT), CNRS, UMR7332, Aix-Marseille Universite, Universite de Toulon, GUILHEM DIF-PRADALIER, XAVIER GARBET, CEA, IRFM — Full orbit effects of charged particle motion in a stochastic magnetic field are investigated. Particles move following the Lorentz force in a prescribed static magnetic field with no electric field in a cylinder with periodic boundary condition. The magnetic field model consists of the perturbation of equilibrium fields with monotonic and reversed shear q-profiles. Unlike the gyrokinetic theory, the adiabatic invariance of the magnetic momentum is not assumed, and the full Hamiltonian equations of motion are numerically integrated by using a symplectic method. Contrary to the simpler case of magnetic field line tracing, the dynamical properties of full orbit is not easily straightforward. To address this issue, we propose a method to construct reduced Poincaré plots from the full particle trajectory in three-dimensional space. This diagnostic is used to clarify the nontrivial relationship between the integrability and stochasticity of field lines and particle orbits. A problem of particular interest is the study of finite Larmor radius effects on the stochasticity and the topology of orbits.

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