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Generalized Skilling Equation for Particle Acceleration in Reconnecting Magnetic Fields LIANG WANG, A. BHATTACHARJEE, M. LEE, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — While particle-in-cell simulations provide valuable information on particle acceleration in two-dimensional reconnection problems, such simulations are much rarer in three dimensions because of the limits of computing power. Hence, analytical approaches to calculating particle distribution functions need to be developed. In recent years, there have been attempts to use variants of Parker's transport equation to particle acceleration problems involving magnetic islands. In this paper, we present the derivation of a generalized Skilling equation (GSE) for guiding-center plasmas that is shown to reduce to Parker's transport equation under some strong assumptions, not generally valid for particle acceleration involving magnetic islands. The GSE assumes gyrotropy, but enables the treatment of anisotropy of the particle distribution function. The equation can be applied to relativistic as well as non-relativistic particles. We will present results on the application of this equation to hydrogen as well as pair plasmas.

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