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Simulation of Ion Diffusion in Kinetic Alfven Waves YU LIN, XUEYI WANG, Auburn University, JAY JOHNSON, Princeton Plasma Physics Laboratory — Kinetic Alfven waves (KAWs) have been suggested to play an important role in the plasma transport. Previously, we carried out a three-dimensional (3-D) hybrid simulation [Lin, Johnson, and Wang, PRL, 2012] for mode conversion from a fast wave to KAWs at the magnetopause, in which the magnetic field is in the $\hat{z}$ direction perpendicular to the density gradient ($\hat{x}$). KAWs with $k_x\rho_i \sim 1$ generated by linear mode conversion were found to nonlinearly decay to modes with $k_y\rho_i \sim 1$. The transfer of energy to large perpendicular and azimuthal k_y modes has been suggested to provide large transport across plasma boundaries. In order to understand the ion diffusion in these KAWs, we now show a further 3-D hybrid simulation combined with test particle calculations for ion cross-field line diffusion in KAWs. A system of uniform plasma is driven by a steady KAW with $k_\perp = k_x$. A turbulence spectrum is obtained. Dependence of the ion diffusion coefficient $D_\perp$ on the driver amplitude, frequency, wave vector, ion beta, T_e/T_i, and the particle energy is obtained. The results are also compared with those based on the quasilinear theory. The 3-D results are compared with the 2-D runs ($k_y = 0$) to show the importance of 3-D physics.

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