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Three-Dimensional Mode Conversion Associated with Kinetic Alfvén Waves YU LIN, Physics Department, Auburn University, Auburn, AL 36849-5311, JAY JOHNSON, Princeton Plasma Physics Laboratory, Princeton, NJ 08543, XUEYI WANG, Physics Department, Auburn University, Auburn, AL 36849-5311 — We report the first three-dimensional (3-D) ion particle simulation of mode conversion from a fast mode compressional wave to kinetic Alfvén waves (KAWs) that occurs when a compressional mode propagates across a plasma boundary into a region of increasing Alfvén velocity. The magnetic field is oriented in the $\hat{z}$ direction perpendicular to the gradients in the background density and magnetic field ($\hat{x}$). Following a stage dominated by linear physics in which KAWs with large wave numbers $k_x\rho_i \sim 1$ (with ρ_i being the ion Larmor radius) are generated near the Alfvén resonance surface, the growth of KAW modes with $k_y\rho_i \sim 1$ is observed in the nonlinear stage when the amplitude of KAWs generated by linear mode conversion becomes large enough to drive a nonlinear parametric decay process, accompanied by a simultaneous excitation of zonal flow modes with similar large k_y. The simulation provides a comprehensive picture of mode conversion and the fundamental importance of the 3-D nonlinear physics to transfer energy to large perpendicular k_y modes, which can provide large transport across plasma boundaries in space and laboratory plasmas.

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