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Magnetic pumping as a source of particle heating EMILY LICHKO, JAN EGEDAL, University of Wisconsin - Madison, WILLIAM DAUGHTON, Los Alamos National Laboratory, JUSTIN KASPER, University of Michigan — Magnetic pumping is a means of heating plasmas for both fusion and astrophysical applications. This study presents a generalized model, related to the compressional pumping model Fisk & Gloeckler applied to the solar wind (2006). Unlike previous models, this model includes diffusion of the anisotropic features which develop in velocity space, thereby allowing energy to be transferred to the particles directly from the turbulence. By using various orderings, the drift kinetic equation can be reduced to a more general form of Parker's equation with an anisotropic distribution function. Through expansions in both pitch angle and in space, it can be shown that this equation has power law solutions and results in an overall heating of the plasma. This form of heating is related to transit-time damping. Kinetic simulations were performed to test the theoretical model and explore regimes where spatial and velocity diffusion are of the same order of importance, regimes not easily available to analytical calculations. These simulations appear to confirm the pumping model in the appropriate limits.

Fisk L.A. & Gloeckler, G. (2006), Astrophys. J. 640, L79.

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