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Chaotic magnetic fields due to asymmetric current configurations - application to cross-field diffusion of particles in cosmic rays[1] B. DASGUPTA, IGPP, UC-Riverside, A.K. RAM, PSFC, MIT — The observed cross-field diffusion of charged particles in cosmic ray transport is assumed to be due to chaotic nature of the interplanetary/intergalactic magnetic fields. The particles are accelerated and energized by the temporal fluctuations of the magnetic field. The generation of chaotic magnetic fields is *ad hoc* and the characteristics of the fields are chosen to satisfy the observations. We consider simple current configurations consisting of circular loops and straight wires that generate asymmetric, nonlinear, steady-state magnetic fields in three spatial dimensions. These magnetic fields are completely deterministic, and, for certain range of parameters, chaotic. We will present analytical and numerical studies on the generation of chaotic magnetic fields and the nature of these fields. The motion of charged particles in these magnetic fields can be described by the Lorentz equation. An analysis of the particle motion will also be presented. A particle moving in a chaotic magnetic field superposed on a uniform background magnetic field is found to undergo spatial transport. This shows that chaotic magnetic fields can produce cross-field diffusion.

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