Abstract Submitted
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Anomalous diffusion of field lines and charged particles in Arnold-Beltrami-Childress force-free magnetic fields[1] B. DASGUPTA, CSPAR, Alabama, A.K. RAM, F. HOLGUIN, PSFC-MIT, V. KRISHNAMURTHY, George Mason — The cosmic magnetic fields in regions of low plasma pressure and large currents, such as in interstellar space and gaseous nebulae, are force-free in the sense that the Lorentz force vanishes. The three-dimensional Arnold-Beltrami-Childress (ABC) field is an example of a force-free, helical magnetic field. The ABC magnetic field lines exhibit a complex and varied structure that is a mix of regular and chaotic trajectories in phase space [1]. The characteristic features of field line trajectories are illustrated through the phase space distribution of finite-distance and asymptotic-distance Lyapunov exponents. In regions of chaotic trajectories, the field lines are superdiffusive. The time evolution of an ensemble of charged particles moving in the chaotic ABC fields is divided into three time domains. For short times, the motion of the particles is essentially ballistic. The intermediate times are characterized by a decay of the velocity autocorrelation function. For longer times, the particles undergo anomalous superdiffusion. Detailed theoretical and numerical results will be presented.

[1] A. K. Ram et al., *Phys. Plasmas* to be published in August 2014.

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