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Statistical Theory of a Magnetized Corona above a Turbulent Accretion Disk[1] DMITRI UZDENSKY, JEREMY GOODMAN, Princeton University — We present a statistical theory of a force-free magnetic field in the corona above a turbulent accretion disk. The field is represented by a statistical ensemble of loops tied to the disk. Each loop evolves under several physical processes: Keplerian shear, turbulent random walk of the disk footpoints, and reconnection with other loops. We introduce the distribution function of loops over their sizes and construct a kinetic equation that governs its evolution. This Loop Kinetic Equation is analogous to Boltzmann's kinetic equation, with loop-loop reconnection described by a binary collision integral. A dimensionless parameter is introduced to scale the overall rate of reconnection relative to Keplerian shear. We solve the loop kinetic equation numerically to obtain the steady state distribution function and also calculate self-consistently the distribution of the mean magnetic pressure and dissipation rate with height, the equilibrium shapes of loops of different sizes, and the energy and torque associated with coronal magnetic loops. We explore the dependence of these quantities on the reconnection parameter.

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