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Non-MHD gravity-driven Hamiltonian dynamo for driving astrophysical jets PAUL BELLAN, Caltech — Conservation of canonical angular momentum $P_\phi = m_\sigma r^2\dot{\phi} + (2\pi)^{-1}q_\sigma\psi(r,z,t)$ shows that charged particles are typically constrained to stay within a poloidal Larmor radius of a poloidal magnetic flux surface $\psi(r,z,t)$. However, more detailed consideration shows that particles with a critical charge to mass ratio can have zero canonical angular momentum and so be both immune from centrifugal force and not constrained to stay in the vicinity of a specific flux surface. Suitably charged dust grains can have zero canonical angular momentum and in the presence of a gravitational field will spiral inwards across poloidal magnetic surfaces toward the central object and accumulate. This accumulation results in a gravitationally-driven dynamo [1], i.e., a mechanism for converting gravitational potential energy into a battery-like electric power source.

[1] P. M. Bellan, Phys. Plasmas 14, Art. No. 122901, 2007

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