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Intrinsic rotation of toroidally confined magnetohydrodynamics JORGE MORALES, WOUTER J.T. BOS, LMFA-CNRS, Ecole Centrale de Lyon - Universite de Lyon, Ecully, France, KAI SCHNEIDER, M2P2-CNRS & CMI, Aix-Marseille University, Marseille, France, DAVID C. MONTGOMERY, Department of Physics and Astronomy, Dartmouth College, Hanover, New Hampshire, USA — Time-dependent three-dimensional toroidal visco-resistive MHD pseudo-spectral computations are performed, using the recently developed penalization method for enforcing the boundary conditions. An imposed toroidal magnetic field is present and the current is driven by an imposed toroidal electric field. Both poloidal and toroidal rotation result, and depend strongly on the shape of the toroidal cross section and the value of the Hartmann number. Net toroidal rotation results from a departure from up/down symmetry in the cross-sectional boundary shape. By increasing the Hartmann number, the plasma seeks out a characteristic configuration in which the velocity aligns approximately with the magnetic field lines. The resulting flow is characterized by both toroidal and poloidal rotation, starting from initial conditions in which such flows are absent. Ideal MHD equilibrium considerations appear not to play an important role.

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