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Intrinsic rotation of toroidally confined magnetohydrodynamics¹ JORGE MORALES, WOUTER BOS, Ecole Centrale de Lyon - LMFA - CNRS, KAI SCHNEIDER, M2P2 - CMI - Aix Marseille University - CNRS, DAVID MONT-GOMERY, Dartmouth College - Hanover (NH) — Time-dependent 3D toroidal visco-resistive MHD 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 at unit magnetic Prandtl number, the plasma seeks out a characteristic configuration in which the velocity aligns increasingly 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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