Abstract Submitted
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Direct numerical simulation of magnetohydrodynamic flow in a toroidal duct STIJN VANTIEGHEM, Universite Libre de Bruxelles, THOMAS DE MAET, Universite Catholique de Louvain, BERNARD KNAEPEN, VICENT MOUREAU, CORIA, CNRS UMR6614 — Magnetohydrodynamics studies the interaction between the motion of electrically conducting fluids and magnetic fields. When the magnetic Reynolds number of the flow is small, which is typical for laboratory-scale experiments and many industrial applications, we can invoke the quasi-static approximation, which states that the induced magnetic field is negligible compared to the externally applied one. In this work, we consider numerical simulations of quasi-static MHD duct flow in a toroidal duct of square cross-section. The choice of this particular geometry was inspired by a recent experimental investigation (P. Moresco and T. Alboussière, J. Fluid. Mech. 2004) of the instability of the Hartmann layers. The scope of this work is however a more moderate regime in terms of Reynolds and Hartmann number, so that the Coriolis force will also play an important role, as expressed by the Elsasser number. We investigate the transition of the flow and the turbulent statistics as a function of the aforementioned parameters.

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