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Simulation of liquid metal duct flow at finite magnetic Reynolds number VINODH KUMAR BANDARU, THOMAS BOECK, JOERG SCHUMACHER, TU Ilmenau, Germany — Turbulent conducting flows at finite magnetic Reynolds numbers occur in magnetohydrodynamic turbulence in plasmas, and in the generation of magnetic fields by the dynamo effect. In simulations the former case is typically studied as box turbulence without walls, and the latter in a closed spherical fluid domain. We are interested in turbulent liquid-metal duct flows in the presence of an exterior localized magnetic field, which is of interest for metallurgical applications. It can be expected to show complex interactions between the field and the flow, which modify both the field and velocity distribution. The evolution of the perturbation in the imposed magnetic field together with the turbulent velocity field in the duct are solved numerically using finite differences through the coupled system of Navier-Stokes and magnetic field transport equations. Characterizing the continuity of the magnetic field perturbations between the exterior and interior of the domain gives rise to non-local boundary conditions which are dealt with the boundary element method. Details of the methodology for numerical computation will be discussed.

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