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Two-dimensional magnetohydrodynamic simulations of time-dependent poloidal flow.[1] LUCA GUAZZOTTO, RICCARDO BETTI, University of Rochester — Poloidal flows in tokamaks are receiving an increasing attention, as newer and better flow measurements keep increasing the amount of available experimental information. In particular, finite poloidal flows are routinely observed in experiments in the edge region of the plasma. MHD theory predicts that when the poloidal velocity is transonic with respect to the poloidal sound speed ($c_{sp} \equiv c_s B_p/B$, where B_p is the poloidal field) shocks will develop in the transonic region. Such shocks will then move in the poloidal direction and disappear once they reach the location of the minimum transverse flow cross section (typically the inboard mid-plane in a low-β plasma). In the aftermath of the shock disappearance, a pedestal in plasma density and pressure is left, with the height of the pedestal depending on the poloidal location. In this work, we present the result of time-dependent simulations aimed at reproducing the theoretical prediction. Simulation results show how an initial condition with transonic flow evolves, creating a train of shocks near the transonic surface, which eventually result in sharp transitions in (e.g.) density profiles, not dissimilar from what is predicted by theory.

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