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Parallel heat flux and flow acceleration in open field line plasmas with magnetic trapping ZEHUA GUO, XIANZHU TANG, CHRIS MCDEVITT, Los Alamos Natl Lab — Various simulations and experimental observations have suggested the importance of kinetic effects, such as particle orbital losses, the anisotropy of distribution functions, and the long mean-free-path of superathermal particles, in the tokamak edge region. The magnetic field strength modulation in a tokamak scrape-off layer (SOL) provides both flux expansion next to the divertor plates and magnetic trapping in a large portion of the SOL. In this work, the effects of magnetic trapping and a marginal collisionality on parallel heat flux and parallel flow acceleration are examined. The various transport mechanisms are captured by kinetic simulations in a simple but representative mirror-expander geometry. The observed parallel flow acceleration is interpreted and elucidated with a modified Chew-Goldberger-Low (CGL) model that retains temperature anisotropy and finite collisionality. We will also show that the use of sheath-boundary-condition in modelling tokamak SOL to be problematic since it simply prohibits the flow transition from subsonic to supersonic at the mirror throat far away from the divertor.

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