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Calculating Pressure-Driven Current Near Magnetic Islands for 3D MHD Equilibria DHANUSH RADHAKRISHNAN, ALLAN REIMAN, Princeton Plasma Phys Lab — In general, 3D MHD equilibria in toroidal plasmas do not result in nested pressure surfaces. Instead, islands and chaotic regions appear in the equilibrium. Near small magnetic islands, the pressure varies within the flux surfaces, which has a significant effect on the pressure-driven current, introducing singularities. Previously, the MHD equilibrium current near a magnetic island was calculated, including the effect of "stellarator symmetry," wherein the singular components of the pressure-driven current vanish [A. H. Reiman, Phys. Plasmas 23, 072502 (2016)]. Here we first solve for pressure in a cylindrical plasma from the heat diffusion equation, after adding a helical perturbation. We then numerically calculate the corresponding Pfirsch-Schluter current. At the small island limit, we compare the pressure-driven current with the previously calculated solution, and far from the island, we recover the solution for nested flux surfaces. Lastly, we compute the current for a toroidal plasma for symmetric and non-symmetric geometries.

Dhanush Radhakrishnan
Princeton Plasma Phys Lab

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