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Global δf neoclassical calculations in a pedestal[1] MATT LANDREMAN, U of Maryland & MIT PSFC, F. PARRA, P.J. CATTO, D.R. ERNST, I. PUSZTAI, MIT PSFC — Conventional calculations of neoclassical flows, current, and fluxes may not be valid in the pedestal since the strong gradients violate the assumed ordering, yet accurate calculation of these quantities is important for understanding edge stability and confinement. We have therefore developed a new radially global continuum neoclassical code PERFECT [1] which allows some radial scale lengths to be as small as the poloidal ion gyroradius. A strong radial electric field with strong shear is also included. In contrast to conventional neoclassical calculations, sources of particles and energy must be determined self-consistently to find the correction to the Maxwellian. The full linearized Fokker-Planck collision operator is implemented, arbitrary collisionality is allowed, and an arbitrary number of species are permitted. Efficiency is aided by a new spectral discretization for velocity space [2] and a preconditioned Krylov-space solver. At large aspect ratio, precise agreement is obtained between the code and recent analytic theory that accounts for finite orbit width effects. At realistic aspect ratio, strong poloidal asymmetries can arise in the flow, breaking the usual form for flows on a flux surface.

[1] PPCF 54, 115006 (2012).
[2] J Comp Phys 243, 130 (2013).

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