Abstract Submitted
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Validation Studies of the Finite Orbit Width version of the CQL3D code[1] YU.V. PETROV, R.W. HARVEY, CompX — The Finite-Orbit-Width (FOW) version of the CQL3D bounce-averaged Fokker-Planck (FP) code [1] has been further developed and tested. The neoclassical radial transport appears naturally in this version by averaging the local collision coefficients along guiding center orbits, with a proper transformation matrix from local (R,Z) coordinates to the midplane computational coordinates, where the FP equation is solved. In a similar way, the local quasilinear rf diffusion terms give rise to additional radial transport of orbits. The main challenge is the internal boundary conditions (IBC) which add many elements into the matrix of coefficients for the solution of FPE on the computational grid, effectively making it a non-banded matrix (but still sparse). Steady state runs have been achieved at NERSC supercomputers in typically 10 time steps. Validation tests are performed for NSTX conditions, but using different scaling factors of equilibrium magnetic field, from 0.5 to 8.0. The bootstrap current calculations for ions show a reasonable agreement of current density profiles with Sauter et al. model equations [2] which are based on 1st order expansion, although the magnitudes of currents may differ by up to 30%.

[1] R.W. Harvey and M. McCoy, "The CQL3D Fokker Planck Code," www.compxco.com/cql3d
[2] O. Sauter, C. Angioni, and Y. R. Lin-Liu, Phys. Plasmas 6 (1999) 2834.

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