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Full-f gyrokinetic simulations for neoclassical toroidal viscosity in a perturbed tokamak configuration SEIKICHI MATSUOKA, Research Organization for Information Science and Technology, YASUHIRO IDOMURA, Japan Atomic Energy Agency, SHINSUKE SATAKE, National Institute for Fusion Science
— A magnetic field perturbation in tokamak plasmas plays a key role in determining the intrinsic rotation and velocity shear, since even a small perturbation can break the axisymmetry in the toroidal direction and induces the finite neoclassical toroidal viscosity (NTV). A simulation study for the NTV evaluation in an axisymmetric tokamak with a small resonant magnetic field perturbation using the full-f gyrokinetic Eulerian code GT5D is presented. The magnetic field perturbation is included in the particle orbit of GT5D only through the Hamiltonian by replacing the axisymmetric magnetic field with the sum of the axisymmetric field and the perturbation, which enables us to perform GT5D simulations without changing the symplectic structure of the single-particle Lagrangian constructed for the equilibrium (axisymmetric) magnetic field. Numerical results are benchmarked with those obtained by the neoclassical transport code, FORTEC-3D, which solves the drift kinetic equation by two-weight δf Monte Carlo method. The NTV of GT5D with a single-helicity perturbation is found to have a similar peaked profile around the resonant surface as that of FORTEC-3D.

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