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Study of nonambipolar transport in perturbed tokamaks with a delta-f particle code KIMIN KIM, JONG-KYU PARK, GERRIT J. KRAMER, Princeton Plasma Physics Laboratory, ALLEN H. BOOZER, Columbia University — Nonaxisymmetric magnetic perturbations can fundamentally change neoclassical transport in tokamaks, by distorting particle orbits on deformed or broken flux surfaces. This so-called nonambipolar transport is highly complex, and eventually a numerical simulation would be required to achieve its precise description and understanding. A new delta-f particle code has been developed for this purpose, using a modified pitch-angle collision operator preserving momentum conservation. The momentum conserving property, which is critical to separate nonaxisymmetic effects from axisymmetic effects in transport, was successfully tested in the axisymmetric case by demonstrating the annihilation of radial particle flux when driven only by like-particle collisions. In the nonaxisymmetic case, it is shown that a resonant perturbation significantly enhances particle flux as expected, but surprisingly that it can reduce bootstrap current. It is also found that nonresonant perturbations enhance both particle flux and bootstrap current, but their effects are generally weaker than a resonant perturbation. More detailed results will be presented and code upgrade plan to study Neoclassical Toroidal Viscosity (NTV) will be discussed. This work was supported by the US DOE Contract #DE-AC02-09CH11466.

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