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Effects of collisions on conservation laws in gyrokinetic field theory H. SUGAMA, National Institute for Fusion Science, T.-H. WATANABE, Nagoya University, M. NUNAMI, National Institute for Fusion Science — In gyrokinetic field theory [1], the gyrokinetic Vlasov equation, Poisson's equation, and Ampere's law are all obtained from the Lagrangian formulation, and conservation laws of energy and momentum for collisionless magnetized plasmas are derived by applying the Noether's theorem [2,3]. In this work, effects of collisions on conservation laws are investigated by using the gyrokinetic Boltzmann equation which includes Landau's collision operator represented in the gyrocenter coordinates. Particle, energy, and momentum transport equations including collisional transport fluxes are systematically derived by modifying Noether's theorem. Then, the ensemble-averaged transport equations of particles, energy, and toroidal momentum given in the present work are shown to include both collisional and turbulent transport fluxes which agree with those derived from the conventional recursive formulation with the WKB representation.

[1] H. Sugama, Phys. Plasmas 7, 466 (2000).
[2] H. Sugama, T.-H. Watanabe, and M. Nunami, Phys. Plasmas 20, 024503 (2013).
[3] H. Sugama, T.-H. Watanabe, and M. Nunami, Phys. Plasmas 21, 012515 (2014).

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