Abstract Submitted
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The Eulerian variational formulation of the gyrokinetic system in general spatial coordinates[1] HIDEO SUGAMA, SEIKICHI MATSUOKA, MASANORI NUNAMI, SHINSUKE SATAKE, National Institute for Fusion Science, TOMOHIKO WATANABE, Nagoya University — The Eulerian variational formulation of gyrokinetic systems with electrostatic turbulence is presented in general spatial coordinates by extending our previous work [H. Sugama, *et al.*, Phys. Plasmas **25**, 102506 (2018)]. The invariance of the action integral under an arbitrary spatial coordinate transformation is used to derive the local momentum balance equation satisfied by the governing equations for the gyrocenter distribution functions and the turbulent potential. This derivation is in contrast with the conventional method using the spatial translation in which the asymmetric canonical pressure tensor generally enters the momentum balance equation. In the present study, the variation of the Lagrangian density with respect to the metric tensor is taken to directly obtain the symmetric pressure tensor which includes the effect of turbulence on the momentum transport. In addition, it is shown in this work how the momentum balance is modified when the collision and/or external source terms are added to the gyrokinetic equation. The results obtained here are considered useful for global gyrokinetic simulations investigating both neoclassical and turbulent transport processes even in general non-axisymmetric toroidal systems.

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