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Heat and momentum transport in arbitrary mean-free path plasma with a Maxwellian lowest order distribution function[1] ANDREI N. SIMAKOV, Los Alamos National Laboratory, PETER J. CATTO, MIT Plasma Science and Fusion Center — Expressions for ion perpendicular viscosity, electron and ion parallel viscosities, gyroviscosities, and heat fluxes, as well as electron-ion energy and momentum exchange terms are derived for arbitrary mean-free path plasmas, in which the lowest order distribution function is a Maxwellian. The latter assumption often holds for plasmas confined by magnetic fields with closed flux surfaces in the absence of strong external driving forces [1], such as neutral beams or radio-frequency waves. In particular, it is always employed in the neoclassical theory. The results are given in terms of a few velocity space integrals of the gyrophase averaged correction to the Maxwellian by assuming the gyroradius is small compared to the shortest perpendicular scale length. The general expressions make possible a hybrid fluid-kinetic description, and correctly reproduce known results in the collisional limit [2].

[1] R. D. Hazeltine and J. D. Meiss, Plasma Confinement (Addison-Wesley, Redwood City, CA, 1991).
[2] P. J. Catto and A. N. Simakov, Phys. Plasmas 11, 90 (2004).

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