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Drift-kinetic theory for electron fluid closures in extended-MHD with applied RF wave sources[1] J.J. RAMOS, M.I.T. Plasma Science and Fusion Center, J.D. CALLEN, C.C. HEGNA, University of Wisconsin-Madison — A form of the electron drift-kinetic equation is derived, suitable to evaluate the pressure anisotropy and the parallel heat flux needed to close the extended-MHD electron fluid equations that describe the interaction of slow macroscopic instabilities with externally applied ECCD waves. The effect of the RF source is represented by a quasilineardiffusion operator and the collisional terms are evaluated under a realistic ordering of the collisionality for fusion-relevant conditions. The analysis is carried out following a systematic expansion in the ratio between the ion sound gyroradius and the macroscopic lengths, assuming first-order distortions from Maxwellian distribution functions and a second-order electron to ion mass ratio. Important physical effects taken into account are the precise contribution of the parallel electric field, inhomogeneous and compressible macroscopic flows, finite ion sound gyroradius effects that contribute to the diamagnetic perpendicular heat flux even in the limit of vanishing electron mass, and independent density and temperature gradients.

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