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Generalized MHD for weakly nonlinear waves in the gyrokinetic regime

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Generalized magnetohydrodynamic equations including linear Landau damping and finite Larmor radius corrections, suitable for both fast and slow dynamics (fluid velocity comparable to or smaller than the ion thermal velocity respectively), are derived and validated by comparison with the linear kinetic theory of mirror modes and kinetic Alfvén waves (KAW). The quenching of the mirror instability at small scales is in particular accurately reproduced. For KAW at quasi-perpendicular propagation, a good agreement is obtained up to scales significantly smaller than the ion Larmor radius. Like for gyrokinetics, decreasing the propagation angle reduces the validity domain, since in both approaches the retained frequencies are assumed much smaller than the ion gyrofrequency. Preliminary one-dimensional simulations in the weakly nonlinear regime will also be discussed.