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Nonlinear gyrofluid simulations of collisionless reconnection FRANCOIS WAELBROECK, Inst. Fusion Studies, Univ. Texas, DANIELA GRASSO, CNR-INFM, Politecnico di Torino, EMANUELE TASSI, CPT, CNRS - Aix-Marseille University — The Hamiltonian gyrofluid model recently derived in Waelbroeck et al. [Phys. Plasmas 16, 032109 (2009)], is used to investigate nonlinear collisionless reconnection with a strong guide field by means of numerical simulations. Finite ion Larmor radius gives rise to a cascade of the electrostatic potential to scales below both the ion gyroradius and the electron skin depth. This cascade is similar to that observed previously for the density and current in models with cold ions. In addition to density cavities, the cascades create electron beams at scales below the ion gyroradius. The presence of finite ion temperature is seen to modify, inside the magnetic island, the distribution of the velocity fields that advect two Lagrangian invariants of the system. As a consequence, the fine structure in the electron density is confined to a layer surrounding the separatrix. Finite ion Larmor radius effects produce also a different partition between the electron thermal, potential, and kinetic energy, with respect to the cold ion case. Other aspects of the dynamics such as the reconnection rate and the stability against Kelvin-Helmholtz modes, are similar to simulations with finite electron compressibility but cold ions.

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