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Two-fluid analysis of the geodesic acoustic mode (GAM) in tokamaks AKIRA HIROSE, CHIJIN XAIO, YUE DING, Univ. of Sask., JAN WEILAND, Chalmers Univ. of Tech. — In the original prediction of electrostatic geodesic acoustic mode (GAM) in toroidal plasmas [1] based on single fluid MHD, the current perturbation along the magnetic field was not considered and incomplete charge neutrality condition was imposed. In low frequency modes in tokamaks, the parallel current is largely carried by electrons as shown in [2]. In electrostatic cases, the electron current is large and short-circuits the perpendicular electric field associated with the GAM. Consequence is that there is no electrostatic GAM in collisionless tokamak discharges. However, in collisional plasma as in edge region, the electron current is retarded and electrostatic dissipative GAM appears. The finding in this study clearly suggests that the GAM is an edge phenomenon confined in a narrow layer at the edge. In collisionless case, the GAM merely increases the Alfven frequency.

[1] N. Winsor et al., Phys. Fluids **11**, 2448 (1968).
[2] H. Nordman, et al., Phys. Fluids B **5**, 3469 (1993); A. Hirose, et al., Phys. Rev. Lett. **72**, 3993 (1994).

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