Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Sub-Alfvénic reduced full-f Kinetic MHD equations to study flute like instabilities[1] W SENGUPTA, A HASSAM, T. M ANTONSEN JR., University of Maryland, College Park — We develop a set of reduced sub-Alfvénic fluid as well as kinetic MHD equations which are suitable for studying flute like instabilities in MHD ordering. The full-f kinetic equations are obtained by reducing Kulsrud's complete set of kinetic MHD system and includes trapped ion dynamics in a toroidal geometry. The nonlinear equations show the presence of Mercier modes, electromagnetic effects, GAMs and Rosenbluth-Hinton zero frequency zonal flows. Linear stability based on our equations shall be compared to the well known Kruskal-Oberman Kinetic MHD stability criteria. In the supersonic limit, for large q, our system can be shown to be equivalent to CGL double adiabatic theory. In the marginal stability limit, we shall discuss trapped particle stabilization of interchange modes. Comparison will also be made to the sub-Alfvénic reduced MHD fluid equations in a large aspect ratio tokamak. We shall show that the trapped particle effects in kinetic theory can be treated as a boundary layer of width the square root of the inverse aspect ratio in phase space.

[1]Work supported by DOE

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Date submitted: 14 Jul 2016 Electronic form version 1.4