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Ion gyroradius effects on zonal flows in extended Hasegawa-Mima models STEPHEN GALLAGHER, BOGDAN HNAT, COLM CONNAUGHTON, SERGEY NAZARENKO, University of Warwick — Zonal flows are important in fusion plasma where they regulate drift wave turbulence and improve plasma confinement. Two mechanisms can lead to the creation of zonal flows: an inverse cascade of energy, similar to that observed for 2D turbulence, and a coupling between wave modes known as the modulational instability. This work focused on the modulational instability; a four mode truncation of the extended Hasegawa-Mima system was derived to model this. The extended Hasegawa-Mima model is more appropriate for tokamaks than its predecessors as it decouples global flows from the flux surface averaged potential of the system. In addition to this truncated model a linearised set of equations for the system has been derived and used to produce a dispersion relation. Finite difference simulations of the whole system have been used to check these models. Previous work, which has largely considered the case where the ion gyroradius has been taken to its limits, has been expanded upon to show how the ion gyroradius can effect the behaviour of drift waves. It has been shown that the ion gyroradius can be used to change the strength of the nonlinearity of the system leading to changes in behaviour that have previously been demonstrated by altering the initial amplitude of the drift wave.

Stephen Gallagher
University of Warwick

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