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On the role of an inverse cascade in ion-scale turbulence GABRIEL PLUNK, TOMO TATSUNO, BILL DORLAND, University of Maryland, College Park — Theoretical works using simplified models of magnetized plasma turbulence have brought a deeper understanding of mechanisms for zonal flow generation and saturation of ion-scale turbulence, and inverse cascade in particular is sometimes cited as an important player. However, these works investigate the Hasegawa–Mima (HM) equation or the Generalized Hasegawa–Mima (GHM) equation that assume cold ions and are thus not applicable for most plasmas. In this work we find a rigorously derived two-dimensional fluid system, valid at finite ion temperature, for turbulence at wavelengths larger than the ion Larmor radius. It is shown that the theoretical basis for an inverse cascade within this model is not present. We also perform the modulational/secondary instability analysis to investigate other mechanisms that are believed to be linked to the growth of a large-scale zonal component. Finally, the results are investigated by direct numerical simulation with AstroGK.

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