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Heating via Kinetic Turbulence in Low Beta Plasmas JASON TENBARGE, GREGORY HOWES, University of Iowa — Kinetic turbulence provides the mechanism by which large-scale spatial motions are transformed into small-scale fluctuations, which are dissipated via kinetic mechanisms into heat. In magnetized plasmas, the cascade is governed by Alfvén waves and is highly anisotropic—the cascade to smaller scales is in the direction perpendicular to the local mean magnetic field. As such, gyrokinetics, in which averages are taken over the gyrophase, is well suited to the study of kinetic turbulence. The gyrokinetic cascade is studied numerically via the simulation code AstroGK, which is based upon a mature code used by the fusion community, GS2. Linear kinetic theory predicts large-scale ion kinetic energy is primarily dissipated as electron heating via a kinetic Alfvén wave cascade in low beta plasmas; however, preliminary gyrokinetic simulations of low beta plasmas suggest much of the initial kinetic energy of the ions remains in the ions and provides enhanced ion heating compared to linear theory. The likely mechanism for the observed difference is the inherently nonlinear entropy cascade, which is a turbulent cascade in velocity space. The enhanced ion heating in these gyrokinetic simulations could provide an explanation for the anomalously high temperatures observed in the low beta plasma of the solar corona.

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