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Constraints on the Dissipation of Solar Wind Turbulence using Gyrokinetic Simulations[1]

GREGORY HOWES, University of Iowa

Gyrokinetic simulation codes, developed to a high level of sophistication in the fusion energy science program, are well suited for the study of turbulence in weakly collisional space and astrophysical plasmas, such as the solar wind. A number of exciting results have recently been achieved in the study of the dissipation range of solar wind turbulence using the Astrophysical Gyrokinetics code, AstroGK. Important results include: (1) a magnetic energy spectrum over the entire dissipation range (from ion to electron scales) that shows striking agreement with high resolution spacecraft observations, (2) evidence for an anisotropic distribution of energy in wavevector space in agreement with arguments for critically balanced kinetic Alfven wave turbulence, (3) an exponentially decaying form of the magnetic energy spectrum at the scale of the electron Larmor radius in agreement with recent observations, and (4) constraints on the partitioning of turbulent power dissipation between collisionless wave-particle interactions and dissipation in current sheets.

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