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Joint Physics - Astronomy Colloquium

Kinetic and Gyrokinetic Astrophysical Turbulence Above and Below the Mirror and Firehose Stability Thresholds

Department of Physics Colloquium



WISCONSIN

The solar wind is weakly collisional. As such, the particle populations that comprise it exhibit a variety of non-Maxwellian features, which are customarily described in terms of interspecies drifts and pressure anisotropies relative to the magnetic field direction. The solar wind is also turbulent, with a power spectrum extending over many orders of magnitude above and below the ion Larmor scale. These two facts, both well documented by the observational community, are not always treated on equal footing in concomitant theoretical work. Current gyrokinetic and reduced-MHD treatments of solar-wind turbulence take the plasma distribution to be Maxwellian. Analyses of pressure-anisotropy-driven Larmor-scale instabilities rarely focus on their contribution to the kinetic-scale turbulent cascade. These issues borne in mind, I will present some analytical and numerical efforts to construct a more suitable theoretical framework for describing inertial-range and Larmor-scale kinetic turbulence in non-Maxwellian astrophysical plasmas. Implications for turbulence in other weakly collisional environments, such as radiatively inefficient accretion flows and the intracluster medium, will also be discussed.