KINETIC EFFECTS IN SMALL SCALE RANGE OF SOLAR WIND TURBULENCE

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Large scale (from a fraction of 1AU to about 400 km) turbulence in Solar Wind is usually described in terms of fluid MHD equations and in this range displays more or less a power law spectrum. At scale of the order of the ion skin depth, space data shows that the power law spectrum is broken. At these lengths a sort of dissipative range is present. Since the solar wind plasma is collisionless, dissipation and plasma heating cannot be described neither by molecular viscosity nor by resistivity, the dynamics being presumably driven by kinetic effects.

A recently developed kinetic hybrid code, where ion dynamics is described by a Vlasov equation and electron dynamics by a fluid generalized Ohm law, is used to study the cross scale link between macroscopic and microscopic scales (i.e. scale larger and smaller than the ion skin depth).

The simulation results compare very well with space data and shows that simultaneously with an increase in ion perpendicular temperature, strong bursts of electrostatic activity in the form of an ion acoustic turbulence are produced, and an accelerated beam in the ion distribution function is observed.