Abstract Submitted
for the MAS15 Meeting of
The American Physical Society

The Common-origin of Kinetic Turbulence and Electron-Halo of Velocity Distribution Function in the Solar Wind HAIHONG CHE, UMCP — Observations of solar wind show that the power spectra of magnetic fluctuations break from Kolmogorov scaling law at ion inertial length. Moreover, the electron velocity distribution function of solar wind exhibits an isotropic halo. What causes the spectral break and electron halo are two puzzles in heliophysics. I present a new model (Che et al., PRL and ApJL 2014) that accounts for both puzzles—the kinetic turbulence and electron halo of solar wind originate from the nanoflare-accelerated keV electron beams in the inner corona. With PIC simulations, we found that the electron beams drive strong two-stream instabilities. The nonlinear evolution of the two-stream instability gives rise to an isotropic electron halo, kinetic Alfvenic wave and whistler wave turbulence through forward and inverse energy cascades.The most important predictions of this model include: 1) the energy injection plateau in the magnetic power spectra; 2) the enhanced parallel electrostatic fluctuation in the solar wind; 3) the core-halo relative drift, a relic of saturated two-stream instability; 4) the temperature ratio of core-halo is determined by the beam instability heating property. The generation of Langmuir waves can produce type III micro-radio bursts that resemble the well-studied type III bursts observed in solar flares.

Haihong Che
UMCP

Date submitted: 20 Sep 2015 Electronic form version 1.4