Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Turbulent transport of trapped electron modes in collisionless magnetized plasma YONG XIAO, University of California, Irvine — A prominent candidate for the electron heat transport in high temperature toroidal plasmas is collisionless trapped electron mode (CTEM) turbulence. Our large scale simulations of CTEM turbulence using gyrokinetic toroidal code (GTC) finds the electron heat transport exhibiting a gradual transition from Bohm to gyroBohm scaling when the device size is increased. The deviation from the gyroBohm could be induced by large turbulence eddies, turbulence spreading and non-diffusive transport process. In the CTEM simulation, radial correlation function shows that the turbulence eddies are predominantly microscopic but with a significant tail in the mesoscale. The macroscopic, linear streamers are mostly destroyed by the zonal flow shearing, which is confirmed by our comprehensive analysis of kinetic and fluid time scales. The mesoscale streamers result from a dynamic process of radial streamers breaking by zonal flows and merging of microscopic eddies. It is further found that the radial profile of the electron heat conductivity roughly follows the global profile of fluctuation intensity, whereas the ion transport tracks more sensitively local fluctuation intensity. This suggests the existence of a non-diffusive component in the electron heat transport, which arises from the ballistic radial drift of trapped electrons due to a combination of the presence of the mesoscale eddies and the weak detuning of the toroidal precessional resonance.

Yong Xiao
University of California, Irvine

Date submitted: 06 Jan 2009 Electronic form version 1.4