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Non-diffusive transport in collisionless trapped electron mode turbulence YONG XIAO, UC Irvine — Gyrokinetic simulations of collisionless trapped electron mode (CTEM) turbulence find that the electron heat transport shows a gradual transition from Bohm to gyroBohm scaling when the device size is increased. Radial correlation function shows that CTEM turbulence eddies are mainly microscopic but with a significant mesoscale tail. The mesoscale streamers result from a dynamical 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 only follows the global profile of the fluctuation intensity, whereas the ion transport tracks more sensitively the local fluctuation intensity. This suggests the existence of a nondiffusive component in the electron heat flux, which arises from the ballistic radial ExB drift of trapped electrons due to a combination of the presence of mesoscale eddies and the weak detuning of the toroidal precessional resonance. In contrast, the ion radial excursion is not affected by the mesoscale eddies due to the parallel wave-particle decorrelation, which is not operational for trapped electrons because of the fast electron bounce motion. This is confirmed by our comprehensive analysis of kinetic and fluid time scales.

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