

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

“Anti-Equilibrium”: The limiting frozen state of kappa distributions GEORGE LIVADIOTIS, Southwest Research Institute, USA — The kappa distribution of particle velocities provides an unambiguous replacement of the Maxwell distribution for systems out of thermal equilibrium. The kappa index is a measure of how far the system of particles is from thermal equilibrium. This “thermodynamic distance” is inversely proportional to the kappa index; it becomes zero at thermal equilibrium where the kappa index is infinite, while it obtains its maximum at the furthest state from thermal equilibrium, where the kappa index is zero, a state called “anti-equilibrium.” By keeping fixed the temperature and decreasing the kappa index, the particles approach this peculiar state of anti-equilibrium and are characterized by a power-law distribution density with spectral index ~ 1.5 ; this constitutes a universal behavior, independent of the system’s number of particles or degrees of freedom. As the kappa decreases and the system approaches the anti-equilibrium state, the particles lose their kinetic energy. This procedure of “kappa-freezing” by decreasing the kappa index at a fixed temperature is similar to the more familiar freezing procedure of decreasing temperature and approaching the “absolute zero” for a fixed kappa index.

George Livadiotis
Southwest Research Institute, USA

Date submitted: 14 Nov 2014

Electronic form version 1.4