

CURVATURE-INDUCED CLUSTERING: NON-EQUILIBRIUM STEADY STATE

Clustering Rate

100%

Anti-Correlation

r = -0.91

Energy Conservation

10⁻²

of runs show
clustering

Correlation with
equilibrium

$\Delta E/E_0$

KEY FINDINGS:

1. Particles form TWO CLUSTERS at ellipse poles (high curvature)
2. Density $\rho(\varphi) \propto 1/\sqrt{g}$ — OPPOSITE of equilibrium prediction
3. Higher temperature → MORE clustering (counter-intuitive)
4. This is a NON-EQUILIBRIUM STEADY STATE, not thermal equilibrium

Equilibrium : $\rho \propto \sqrt{g}$ (WRONG!)

Observed : $\rho \propto 1/\sqrt{g} \propto \kappa^{2/3}$