Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Probing temperature chaos through thermal boundary conditions[1] WENLONG WANG, JONATHAN MACHTA, University of Massachusetts Amherst, HELMUT KATZGRABER, Texas A&M University — Using population annealing Monte Carlo, we numerically study temperature chaos in the three-dimensional Edwards-Anderson Ising spin glass using thermal boundary conditions. In thermal boundary conditions all eight combinations of periodic vs antiperiodic boundary conditions in the three spatial directions appear in the ensemble with their respective Boltzmann weights, thus minimizing finite-size corrections due to domain walls. By studying salient features in the specific heat we show evidence of temperature chaos. Our results suggest that these bumps are mainly caused by system-size excitations where the free energy of two boundary conditions cross. Furthermore, we study the scaling of both entropy and energy at boundary condition crossings and find that the scaling of the energy is very different from the scaling obtained by a simple change of boundary conditions. We attribute this difference to the stronger finite-size effects induced via a simple change of boundary conditions. Finally, we show that temperature chaos occurs more frequently at higher temperatures within the spin-glass phase and for larger system sizes, while the normalized distribution function with respect to temperature is about the same for different system sizes.

[1]The work is supported from NSF (Grant No. DMR-1208046).

Wenlong Wang
University of Massachusetts Amherst

Date submitted: 14 Nov 2014 Electronic form version 1.4