

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Self-organized criticality in glassy spin systems requires long-range interactions JUAN CARLOS ANDRESEN, RUBEN S. ANDRIST, Department of Physics, ETH Zurich, HELMUT G. KATZGRABER, Department of Physics and Astronomy, Texas A&M University, VLADIMIR DOBROSAVLJEVIC, Department of Physics and National High Magnetic Field Laboratory, Florida State University, GERGERLY T. ZIMANYI, Department of Physics, University of California — We investigate the conditions required for general spin systems with frustration and disorder to display self-organized criticality, a property which so far has been established in spin models only for the infinite-range Sherrington-Kirkpatrick Ising spin-glass model [PRL 83, 1034 (1999)]. We study the avalanche and the magnetization jump distribution triggered by an external magnetic field in the short-range Edward-Anderson Ising spin glass for various space dimensions, between 2 and 8. Our numerical results, obtained on systems of unprecedented size, demonstrate that self-organized criticality is recovered only in the strict limit of infinite space dimensions (or equivalently of long-ranged interaction), and is not a generic property of spin-glass models in finite space dimensions.

Juan Carlos Andresen
Department of Physics, ETH Zurich

Date submitted: 07 Nov 2012

Electronic form version 1.4