Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Resolution-dependent mechanisms for bimodal switching time distributions in simulated Fe nanopillars[1] S.H. THOMPSON, G. BROWN, P.A. RIKVOLD, Florida State U., M.A. NOVOTNY, Mississippi State U. — Numerical simulations of magnetization reversals of iron nanopillars in off-axis applied fields at different lattice resolutions reveal bimodal distributions in the switching times (first-passage times through 0 of the longitudinal magnetization, M_z). We show that the mechanisms responsible for these distributions are resolution-dependent. The highest-resolution model, in which the computational cell is smaller than the exchange length, is three-dimensional. Here, the bimodal distribution results from a reversal process in which the pillar sometimes avoids a metastable free-energy well. At medium resolution, the pillar is modeled as a 1-D stack of spins. The bimodal distribution then reflects whether the reversal starts from one or both ends. Finally, for a low-resolution model in the form of a single spin with an anisotropic potential, the bimodal distribution is an artifact of the definition of a switching event: the result of the spin precessing close to $M_z = 0$. While the zero- and one-dimensional models display bimodal switching-time distributions, the mechanisms are different than for the three-dimensional model. Only the latter captures the mechanism that is most interesting from an experimental and device-application point of view.

[1]Supported by NSF grant DMR-0444051.

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Date submitted: 30 Nov 2007 Electronic form version 1.4