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**Spontaneous magnetic fluctuations in ultrathin magnetic films at zero field** ANDREW BALK, Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899 Maryland NanoCenter, University of Maryland, College Park, MD 20742, JOHN UNGURIS, Center for Nanoscale Science and Technology, NIST, Gaithersburg, MD 20899 — We use magneto optical Kerr effect (MOKE) microscopy to observe room temperature, zero field magnetic fluctuations in perpendicularly magnetized cobalt films at thicknesses near the in-plane to out-of-plane spin reorientation transition. The magnetic behavior of our films resembles that of collections of superparamagnetic particles, in that globally they exhibit zero net moment, while local areas continually undergo thermal magnetic fluctuations between saturated states of the maze-like domain structure. Unlike superparamagnetic particles, the fluctuations are not constrained by particle boundaries and thus are subject to both exchange and magnetostatic interactions. Due to this we can observe temporal and spatial correlations in the fluctuations. Furthermore, we observe that the fluctuations obey dynamics distinct from field-driven Barkhausen jumps. We also determine scaling exponents of the fluctuations, finding their areas follow a power law distribution (t =1.5), and their temporal noise power spectrum is close to 1/f (a = 1.04). Based on these observations, we discuss these films as possible candidates for exhibiting magnetic self-organized criticality.

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