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Dimensional reduction, avalanches and disorder in artificial kagome spin ice[1] REMO V. HUGLI, GERARD DUFF, HANS-BENJAMIN BRAUN, University College Dublin — In collaboration with an experimental team at the Swiss Light Source we have recently demonstrated that emergent monopoles and associated Dirac strings can directly be observed in real space via x-ray circular dichroism in a kagome lattice geometry. Here we build on the fact that the experimental results are in excellent agreement with MC simulations of a lattice of point dipoles with disorder realized in the form of random switching fields. We demonstrate that within a large range of physical parameters such as interdipolar coupling and randomness, magnetization reversal proceeds via a novel 1D avalanche behaviour whose hallmark is an exponential avalanche size distribution. After presenting simple arguments for the origin of such dimensional reduction we demonstrate that such 1D avalanche behavior also occurs in a model where the dipoles are stretched into magnetic charge dumbbells which provides a more realistic model for nanolithographic islands. Finally we demonstrate how a judicious design of the island anisotropy can be used to achieve controlled switching and avalanche propagation which paves the way for spintronic applications

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