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Topological defects in thin films during simulation of magnetization reversal[1] ADEBANJO ORIADE, Bethany College, Lindsborg KS — Topological defects arise during the magnetization reversal of a NiFe ferromagnetic thin film. The reversal process is described by accounting for topological defects (singularities in the order-parameter space) and by using aspects of the theory of homotopy groups. The spin configuration data consists of planar spins on a two dimensional lattice, and it is shown that a singularity can be found at a point not on the lattice, by inspecting the winding number n. Singularities could either be topologically unstable ($n = 0$) or topologically stable ($n \neq 0$). Some topological defects (such as an anti-vortex, winding number $n = -1$) are not obvious in a plot of the spin configurations of the film. The conservation of winding number for the entire sample in the course of reversal can be used to check that all topological defects are accounted for. One reason these defects are *hidden* is the inevitably coarse grained representation of the film in the finite-temperature Monte-Carlo simulation. Typical dimensions of the film are $0.2\mu m \times 1\mu m \times 5nm$ and the grain size is about $8nm \times 8nm \times 5nm$. A method for locating topological defects hidden within the simulation lattice will be discussed.

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