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A Γ -convergence result for Néel walls in micromagnetics

The Néel wall is a dominant transition layer in thin ferromagnetic films. It is characterized by a one-dimensional in-plane rotation connecting two (opposite) directions of the magnetization. It is a two length scale object: a small core with fast varying rotation and two logarithmically decaying tails. There are three confining mechanisms for the Néel tails: the anisotropy of the material, steric interaction with the sample edges and steric interaction with the tails of neighboring Néel walls. We describe these models that correspond to three non-convex and non-local variational problems depending on a small parameter. The aim of the talk is to prove the Γ -convergence of these three energies. The limiting magnetizations have a finite number of jumps corresponding to the same angle wall. The Γ -limit counts the number of walls and the energy of a wall is quadratically in the angle wall.