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Stripes and hysteresis in thin film ferromagnets DAVID CLARKE, OLEG TRETIAKOV, OLEG TCHERNYSHYOV, Johns Hopkins University — Recent experimental studies have focused on the magnetic behavior of thin materials that have strong out-of-plane anisotropy. We study the behavior of such systems near the reorientation phase transition (RPT), the point at which the dipolar interaction overcomes the internal anisotropy to force the magnetization to lie in the plane. Previous studies have classified canted, polarized, and stripe domain regions of the thermodynamic phase diagram, but have not found the boundaries of metastability necessary for an understanding of observed hysteresis curves. We complete the anisotropy-applied field phase diagram near the RPT by including metastability boundaries and find the hysteresis loops characteristic of the model using analytic and numerical techniques. The system displays a line of second order transitions from a canted phase to a spin density wave (SDW) phase, and first order transitions from the SDW phase to a striped phase. We show the existence of a liquid-gas like critical point beyond which the SDW and striped phases are indistinguishable. The phase diagram is universal for thin ferromagnetic materials up to a rescaling of the applied field and effective anisotropy by a characteristic value proportional to the square of the ratio of the thickness to the exchange length. The hysteresis loops found match behavior observed in experiments. This work was supported in part by NSF Grant DMR-0520491

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