Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Dispersive elastic properties of Dzyaloshinskii domain walls JAMES PELLEGREN, DEREK LAU, VINCENT SOKALSKI, Carnegie Mellon University — Recent studies on the asymmetric field-driven growth of magnetic bubble domains in perpendicular thin films exhibiting an interfacial Dzyaloshinskii-Moriya interaction (DMI) have provided a wealth of experimental evidence to validate models of creep phenomena, as key properties of the domain wall (DW) can be altered with the application of an external in-plane magnetic field. While asymmetric growth behavior has been attributed to the highly anisotropic DW energy, $\sigma(\theta)$, which results from the combination of DMI and the in-plane field, many experimental results remain anomalous. In this work, we demonstrate that the anisotropy of DW energy alters the elastic response of the DW as characterized by the surface stiffness, $\tilde{\sigma}(\theta) = \sigma(\theta) + \sigma(\theta)$, and evaluate the impact of this stiffness on the creep law. We find that at in-plane fields larger than and antiparallel to the effective field due to DMI, the DW stiffness decreases rapidly, suggesting that higher energy walls can actually become more mobile than their low energy counterparts. This result is consistent with experiments on CoNi multilayer films where velocity curves for domain walls with DMI fields parallel and antiparallel to the applied field cross over at high in-plane fields.

James Pellegren
Carnegie Mellon University

Date submitted: 11 Nov 2016 Electronic form version 1.4