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A microscopic model for ultrafast remagnetization dynamics<sup>1</sup> BIPLAB SANYAL, RAGHUVEER CHIMATA, ANDERS BERGMAN, Dept. of Physics and Astronomy, Uppsala University, Sweden, LARS BERGQVIST, Department of Materials Science and Engineering, KTH, Sweden, OLLE ERIKSSON, Dept. of Physics and Astronomy, Uppsala University, Sweden — In this work, we provide a microscopic model for the ultrafast remagnetization of atomic moments already quenched above Stoner-Curie temperature by a strong laser fluence. Combining first principles density functional theory, atomistic spin dynamics utilizing the Landau-Lifshitz-Gilbert equation and a three temperature model, we show the temporal evolution of atomic moments as well as the macroscopic magnetization of bcc Fe and hcp Co covering a broad time scale, ranging from femtoseconds to picoseconds. Our simulations show [1] a variety of complex temporal behavior of the magnetic properties resulting from an interplay between electron, spin and lattice subsystems, which causes an intricate time evolution of the atomic moment, where longitudinal and transversal fluctuations result in a macro spin moment that evolves highly nonlinearly.

[1] Raghuveer Chimata, Anders Bergman, Lars Bergqvist, Biplab Sanyal and Olle Eriksson, Phys. Rev. Lett. **109**, 157201 (2012).

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