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Unveiling magnetic Hysteresis PAULA MELLADO, ANDRES CONCHA, DAVID AGUAYO, Adolfo Ibez University — Hysteresis manifests as the lack of retraceability of the magnetization curve in magnetic systems. It has been associated with rotation of magnetization and changes of magnetic domains. However, up to date there has been no realization that allows to separate these coupled mechanisms. We introduce a minimal magnetic system where hysteresis is realized in a simple and minimal fashion. The basic units are a few U(1) ferromagnetic altitudinal rotors placed along a one dimensional chain. They exhibit a dissipative dynamics, interacting via magnetic coupling among them and via Zeeman interaction with the external magnetic field. The system displays a hysteretic behavior starting with N=2 rotors which remains qualitatively invariant as more magnets are added to the chain. We explain this irreversibility by using a model that includes Coulombic interactions between magnetic charges located at the ends of the magnets, zeeman coupling and viscous dissipation. We show that interactions between the unit components is the key element responsible for hysteresis and find that the ability to perceive hysteresis, depends on how the time frequencies of damping and interactions inherent to the system compare with the time frequency set by the external field ramping rate.

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