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Laboratory Experiments for Exploring Solar Flux Rope Stability[1]
JOSHUA LATHAM, Princeton University, ANDREW ALT, HANTAO JI, Princeton Plasma Physics Laboratory — Magnetic flux ropes (MFR) on the solar surface are thought to be the precursors of coronal mass ejections (CMEs), and these ejection events may correlate with magnetohydrodynamic instabilities such as the torus instability and kink instability. However, in some cases where an MFR is torus-unstable, magnetic self-organization events may reduce the energy and prevent an eruption. These self-organization events conserve helicity over their timescales, and for toroidal plasmas Taylor showed that the profile of $\mu \equiv \frac{\mathbf{J}\cdot\mathbf{B}}{B^2}$ is constant for the minimum-energy state.[1] The Magnetic Reconnection Experiment (MRX) was outfitted with electrodes in order to create MFR. An array of over 300 in-situ magnetic probes was used to capture a 2D cross-section of the magnetic field along with limited out-of-plane measurements. Earlier work by Myers, et. al created classifications for the experimental MFR behavior as either eruptive, failed-eruptive, or stable.[2] In this poster, the dynamics of $\mu \equiv \frac{\mathbf{J}\cdot\mathbf{B}}{B^2}$ are more closely examined for correlations with the behavior of the MFR and for signals of Taylor relaxation.
1. Taylor, *Rev. Mod. Phys.* **58**, 741-763 (1986)
2. Myers, et. al. *Nature* **528**, 526-529 (2015)

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