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Stability Properties and Relaxation of Arched, Line-Tied Flux Ropes[1] ANDREW ALT, Princeton University, CLAYTON MYERS, Sandia National Laboratories, HANTAO JI, Princeton University, JONATHAN JARA-ALMONTE, JONGSOO YOO, MASAAKI YAMADA, Princeton Plasma Physics Laboratory — Coronal mass ejections occur when long-lived magnetic flux ropes (MFR) anchored to the solar surface destabilize and erupt away from the Sun. These eruptions are driven in part by ideal MHD instabilities such as the kink and torus instabilities. These instabilities have long been considered in axisymmetric fusion devices where their instability criteria are given in terms of the edge safety factor and confining magnetic field decay index respectively. Previous laboratory experiments performed on the Magnetic Reconnection Experiment (MRX) revealed a class of MFRs that were torus-unstable but kink-stable, which failed to erupt. These "failed-tori" went through a process similar to Taylor relaxation before their eruption ultimately failed. In more recent experiments we have investigated this behavior through additional diagnostics that allow us to measure the magnetic field in a 2D cross-section of the MFR along with limited out-of-plane measurements. These out-of-plane measurements allow for better measurement of the magnetic forces within an MFR. Understanding of the dynamic forces gives insight into the mechanisms behind eruptions and failed eruptions. The magnetic self-organization has also been investigated by measuring the redistribution of toroidal current within the MFRs.

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Andrew Alt
Princeton University

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