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Stability Properties and Intermittent Failed Eruptions of Arched, Line-Tied Magnetic Flux Ropes[1] ANDREW ALT, Princeton University, HANTAO JI, JONATHAN JARA-ALMONTE, JONGSOO YOO, SAYAK BOSE, 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 considered to be driven by ideal MHD instabilities such as the kink and torus instabilities. These instabilities have long been considered in axisymmetric fusion devices where the instability criteria are given in terms of the edge safety factor and confining magnetic field decay index, respectively. Laboratory experiments have been performed in the Magnetic Reconnection Experiment (MRX), where the stability properties of the ropes were controlled via the external fields. A recent observation in these experiments is the existence of ropes which intermittently erupt. These ropes have stable periods, lasting longer than an Alfvèn time, interrupted by quick rises which end when the rope falls back down to the stable height before it fully erupts. This repeated behavior is similar to the storage and release in homologous events on the Sun. The work presented here investigates several potential causes for both the initiation of the eruptive events and the collapse back to stability. Understanding the trigger mechanism for the intermittent ropes also gives insight into the stability criteria for other MFR experiments in MRX.

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