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Equilibrium force balance and eruptive instabilities in solar-relevant laboratory magnetic flux ropes[1] C.E. MYERS, M. YAMADA, E.V. BELOVA, H. JI, J. YOO, J. JARA-ALMONTE, Princeton Plasma Physics Laboratory — Quasi-statically driven line-tied magnetic flux ropes are studied in the context of storage-and-release eruptions in the solar corona. The Magnetic Reconnection Experiment (MRX) facility is utilized to produce these arched low-β flux ropes. Detailed *in situ* magnetic measurements and supporting MHD simulations permit quantitative analysis of the plasma behavior. We find that the orientation of the applied potential magnetic field arcade with respect to the flux rope footpoints (i.e., the electrodes) is key. With an arcade that is aligned *parallel* to the footpoints, force free currents induced in the expanding flux rope modify the pressure and tension in the arcade to produce a confined, quiescent discharge and a saturated kink instability. In an *obliquely* aligned arcade, on the other hand, a sigmoidal equilibrium forms that can dynamically erupt. Both the kink instability and the torus instability are studied as candidate eruptive mechanisms—the latter by varying the vertical gradient of the potential field arcade. New 2D magnetic measurements of these equilibrium and eruptive features facilitate comparisons to solar observations and modeling.

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