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Apex Dips of Experimental Flux Ropes: Helix or Cusp?[1] MAGNUS HAW, PAKORN WONGWAITAYAKORNKUL, Caltech, HUI LI, SHENGTAI LI, LANL, PAUL M. BELLAN, Caltech — We present a new theory for the presence of apex dips in certain experimental flux ropes. Previously such dips were thought to be projections of a helical loop axis generated by the kink instability. However, new evidence from experiments and simulations suggest that the feature is a 2D cusp rather than a 3D helix. The proposed mechanism for cusp formation is a density pileup region generated by nonlinear interaction of neutral gas cones emitted from fast-gas nozzles. The results indicate that small density perturbations can result in large distortions of an erupting flux rope, even in the absence of significant pressure or gravity forces. The density pileup at the apex also suppresses the m=1 kink mode by acting as a stationary node. Consequently, more accurate density profiles should be considered when attempting to precisely model the stability and eruption of solar flux ropes such as CME's.

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Magnus Haw
Caltech

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