Abstract Submitted
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Experimental observation of three-dimensional, impulsive reconnection events and associated signatures of spontaneously generated flux ropes[1] S. DORFMAN, CMSO, UCLA, H. JI, M. YAMADA, J. YOO, E. LAWRENCE, C. MYERS, T.D. THARP, CMSO, PPPL — Fast, impulsive reconnection is commonly observed in laboratory, space, and astrophysical plasmas. Many existing models of reconnection attempt to explain this behaviour without including variation in the third direction. However, the impulsive reconnection events observed on the Magnetic Reconnection Experiment (MRX) are characterized by large local gradients in the third direction and cannot be explained by 2-D models. Signatures of flux rope dynamics in the two-fluid regime are identified and found to play a key role. These "flux ropes" are spontaneously generated in the layer and observed down to the smallest scales resolved by the diagnostics. The observed drop in the reconnection current and spike in the reconnection rate during the impulsive reconnection event are due to ejection of these structures from the layer. By contrast, even though electromagnetic fluctuations in the Lower Hybrid frequency range consistent with [1] are concurrently observed [2], they are not the key physics responsible. A qualitative, 3-D, two-fluid model consistent with [3] is proposed to explain the observations.

[1] H. Ji et al., Phys. Rev. Lett. 92, 115001 (2004).
[2] M. Yamada, Phys. Plasmas 18, 111212 (2011).
[3] J.D. Huba and L.I. Rudakov, Phys. Plasmas 10, 3139 (2003).

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