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Order unity reconnection rate scaling during anti-parallel magnetic reconnection on TREX[1] JOSEPH OLSON, JAN EGEDAL, SAM GREESS, ALEX MILLET-AYALA, RACHEL MYERS, CARY FOREST, University of Wisconsin - Madison, WIPPL TEAM — The Terrestrial Reconnection Experiment (TREX) is a device optimized to study the role of kinetic dynamics during collisionless magnetic reconnection[2]. In a recent experimental run consisting of ~ 900 shots while varying certain experimental parameters we measured the reconnection rate using the Cassak-Shay scaling for asymmetric anti-parallel reconnection[3]. In this study, we observe that the absolute reconnection rate E_{rec} is set by the applied drive voltage while being insensitive to the applied background field, ion species, or plasma density. However, for all epxerimental configurations the observed relative reconnection rate is $E_{rec}/(V_A B_{rec}) \sim 1$ instead of the expected rate of $E_{rec}/(V_A B_{rec}) \sim 0.1$. These experiments suggest that the reconnecting magnetic field self-regulates to match the externally applied drive in order to provide a self-consistent reconnection rate. This has important implications for determining the parameters of any given reconnection experiment while also challenging the ubiquity of the 0.1 rate scaling for fast magnetic reconnection.

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[2]Olson, J., et al., Phys. Rev. Letters, **116**, 255001 (2016).
[3]Cassak, P.A., and Shay, M.A., Phys. of Plasmas, **14**, 102114 (2007).

Joseph Olson
University of Wisconsin - Madison

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