Order unity reconnection rate scaling during anti-parallel magnetic reconnection on TREX\textsuperscript{1} JOSEPH OLSON, JAN EGEDAL, SAM GREESS, ALEX MILLET-AAYALA, 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\textsuperscript{2}. In a recent experimental run consisting of $\sim 900$ shots while varying certain experimental parameters we measured the reconnection rate using the Cassak-Shay scaling for asymmetric anti-parallel reconnection\textsuperscript{3}. In this study, we observe that the absolute reconnection rate $E_{\text{rec}}$ is set by the applied drive voltage while being insensitive to the applied background field, ion species, or plasma density. However, for all experimental configurations the observed relative reconnection rate is $E_{\text{rec}}/(V_A B_{\text{rec}}) \sim 1$ instead of the expected rate of $E_{\text{rec}}/(V_A B_{\text{rec}}) \sim 0.1$. 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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