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Effects of Global Boundary and Local Collisionality on Magnetic Reconnection in MRX H. JI, A. KURITSYN, M. YAMADA, S. GERHARDT, Y. REN, PPPL — The magnetic reconnection process is generally thought to be determined by both global constraints and local plasma dynamics. However, how exactly the reconnection depends on both these aspects is under heated debates. For example, in numerical simulations the reconnection rate can be independent [1] or dependent on the system size [2] or even on whether the boundary is open or closed [3]. In this poster, we report a systematic study of reconnection dependence on global boundary conditions (the distance between two flux cores) and local plasma parameters in the MRX device. It is found that the reconnection rate is a function of both local plasma collisionality and global boundary conditions. At a given flux-core distance, the current sheet length is inversely proportional to the effective resistivity, depending on the plasma collisionality. As a result, the reconnection is accelerated by both the resistivity enhancement and the current sheet shortening. At a given collisionality, the current sheet length increases with the flux-core distance, slowing down the reconnection rate. The observed rate dependance can be explained by the generalized Sweet-Parker model [4] which approximates the diffusion region shape by a rectangular box. Implications to large space and astrophysical systems will be discussed. This work is supported by DoE under contract #DE-AC02-76- CH03073. [1] Shay et al. JGR (1999). [2] Wang et al. PRL (2001). [3] Daughton et al. PoP (2006). [4] Ji et al. PRL (1998).

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