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Energetics of the magnetic reconnection in laboratory and space plasmas[1] MASAAKI YAMADA, Princeton Plasma Physics Laboratory, Princeton University, Princeton NJ USA — The essential feature of magnetic reconnection is that it energizes plasma particles by converting magnetic energy to particle energy. This talk addresses this key unresolved question; how is magnetic energy converted to plasma kinetic energy during reconnection? Our recent study on MRX [1] demonstrates that more than half of the incoming magnetic energy is converted to particle energy at a remarkably fast speed ($\sim 0.2V_A$) in the reconnection layer. A question arises as to whether the present results should be applied to magnetic reconnection phenomena in the space astrophysical plasmas. In a reconnection region of effectively similar size in the Earth's magnetotail, the energy partition was carefully measured during multiple passages of the Cluster satellites [2]. The half length of the tail reconnection layer (L) was estimated to be 2000–4000 km namely 3–6 d_i, (ion skin depth); the scale length of this measurement is very similar to the MRX case, $L \sim 3d_i$. Reconnection in the magneto-tail is driven by an external force, i.e., the solar wind, and the boundary conditions are very similar to the MRX setup. The observed energy partition is notably similar, namely, more than 50% of the magnetic energy flux is converted to the particle energy flux, which is dominated by the ion enthalpy flux, with smaller contributions from the electron enthalpy and heat flux. A broad implication will be discussed.

[1] M. Yamada et al, This conference, Submitted *to Nature Communications* (2014).
[2] J. P. Eastwood *et al.*, *PRL* **110**, 225001 (2013).

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Masaaki Yamada
Princeton Plasma Physics Laboratory,
Princeton University, Princeton NJ USA

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