Ion and Electron Bulk Heating in Magnetic Reconnection: Dependence on the Inflow Alfven Speed and Magnetic Shear Angle

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Based on observations of reconnection at Earth's magnetopause we found that the amount of ion and electron heating are correlated with the Alfvén speed based on the reconnecting magnetic field and the plasma number density measured in the reconnection inflow regions. Our empirical finding may explain the relatively weak ion and electron heating in solar wind reconnection exhausts at 1 AU and strong heating to keV (~10^7-10^8 K) energies common in Earth's magnetotail exhausts. The finding could potentially be used to evaluate the role of reconnection in plasma bulk heating in laboratory, solar and astrophysical contexts. For example, in the solar coronal region where the local Alfven speed is ~2200 km/s (based on B ~ 100 Gauss, N~ 10^{10} cm^{-3}), the electrons could be heated up to 10^7 K (or ~1 keV) by reconnection.