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Ion Heating During Reconnection Events in MST[1]

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Magnetic reconnection is often accompanied by plasma heating in both laboratory and astrophysical situations, but the mechanism which converts the released magnetic energy to thermal energy remains unclear. In the Madison Symmetric Torus, spontaneous bursts of reconnection heat plasma ions, resulting in a doubling of the temperature in about one-hundred microseconds. Recent advances in diagnostics allow us to spatially and temporally resolve this heating for both majority deuterium and impurity ions. We find that the heat source is active throughout the plasma volume and appears stronger for impurities, implying a dependence on ion mass and/or charge. The heating is strongest when many nonlinearly coupled reconnection sites are active and weaker when only a few are active. Theoretical work to assess the importance of viscous damping of the flows associated with reconnection suggests they could be important. Work is supported by U.S.D.O.E. and N.S.F.

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