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Measurements of global and localized ion heating during impulsive reconnection in MST S. GANGADHARA, D. CRAIG, D.A. ENNIS, D.J. DEN HARTOG, A.F. ALMAGRI, B.E. CHAPMAN, G. FIKSEL, S.C. PRAGER, University of Wisconsin-Madison, Center for Self-Organization in Laboratory and Astrophysical Plasmas — In the MST reversed field pinch, impulsive reconnection occurs at (a) sawtooth crashes in standard plasmas, in which many large tearing modes are present, and (b) bursts of edge-resonant tearing modes with poloidal mode number $m = 0$ in enhanced confinement plasmas. In both cases, magnetic energy decreases while ion thermal energy increases. Fast, localized measurements of the impurity ion temperature (T_i) are made using charge exchange recombination spectroscopy. Ion heating is observed to be limited to the outer half of the plasma for an $m = 0$ burst, and is strongest near the $m = 0$ resonant surface. Conversely, ion heating occurs at all radii during a sawtooth crash, as T_i more than doubles over ~ 100 μs. The results suggest that ions are heated primarily near the reconnection layer, and that global heating during a crash arises from activity at multiple reconnection sites throughout the plasma. Both the heating profile and degree of heating during a crash vary strongly with plasma current, density, the reversal parameter, and ion species. At high plasma current (0.5 MA), the large T_i (> 1 keV on-axis) generated during a crash can be sustained by reduction of magnetic fluctuations using auxiliary current drive. Work supported by U.S.D.O.E. and N.S.F.

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