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Experimental Study of Three-Dimensional Localized Magnetic Reconnection by Use of Merging Torus Plasmas TORU II, YOSHINORI HAYASHI, MICHIAKI INOMOTO, YASUSHI ONO, University of Tokyo — Three-dimensional (3-D) localized magnetic reconnection was studied experimentally in the University of Tokyo Spherical Torus (TS-4) plasma merging device using controlled external compression force and guide field. We found two unsteady effects: 3-D deformation and ejection of current sheet cause fast magnetic reconnection. When strong compression force $I_{\rm Acc} \sim 60$ kA compressed two compact toroids with low guide field $B_t \sim B_\parallel$ ($B_\parallel$ is reconnecting field component), toroidal modes $n = 1$–3 of current sheet was observed to grow only during their reconnection. A new finding is that 3-D deformation of current sheet promotes mass ejection from current sheet and causes the reconnection rate as well as the reconnection outflow to increase. When weak compression force $I_{\rm Acc} \sim 0$ kA compressed two compact toroids with high guide field $B_t \sim 7B_\parallel$, their reconnection rate was maintained small. These phenomena indicate that 3-D localized reconnection is one of fast reconnection mechanisms.

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