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Plasma dynamics and heating/acceleration during driven magnetic reconnection C.Z. CHENG, University of Tokyo, SHIZUO INOUE, Japan Atomic Energy Agency, YASUSHI ONO, University of Tokyo, RITOKU HORIUCHI, National Institute of Fusion Science — Highlights of the plasma dynamics and energization during driven anti-parallel magnetic reconnection are presented. The MHD condition breaks down in the entire reconnection layer (the reconnection current layer, the separatrix region and the whole downstream), and the plasma dynamics is significantly different from the results of the Hall-MHD model. In particular, we explain (1) how electron and ion dynamics decouple and how the charge separation and electrostatic electric field are produced in the magnetic field reversal region (reconnection current layer and outflow exhaust) and around the separatrix regions, (2) how electrons and ions gain energy in the reconnection current layer, (3) why the electron outflow velocity in the reconnection exhaust reaches super-Alfvenic speed and the ion outflow velocity reaches Alfvenic speed and how the parallel electric field is produced, (4) how electrons are accelerated by the parallel electric field around the separatrix region, and (5) how ions gain energy when they move across the separatrix region into the downstream. Finally we show that electrons and ions gain energy mainly from the inductive reconnection driven electric field and less from the electrostatic electric field.

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