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Fast magnetic reconnection regime in double tearing modes¹ Z.X. WANG, Dalian University of Technology, China, X.G. WANG, Peking University, China, J.Q. DONG, Y.X. LONG, Z.Z. MOU, W.X. QU, Southwestern Institute of Physics — Nonlinear phases of magnetic reconnection in double tearing modes are studied. The first two nonlinear phases of magnetic reconnection lead to the formation of magnetic islands followed by a fast phase to complete the reconnection process with all field lines reconnected and islands vanished. Resistivity dependences for various phases are studied and shown by scaling analysis for the first time. It is shown that after an early non-constant- ψ Sweet-Parker phase with a $\eta^{1/2}$ -scale, the long nonlinear phase is in a Rutherford regime with a η -scale following by the fast reconnection phase with a very fast $\eta^{1/5}$ -scale. The latter phase is found generated by a process of neighboring magnetic separatrices merging and magnetic islands coupling, with a very fast reconnection rate weakly depended on plasma resistivity. The fast reconnection rate can be understood as a result of the island coupling equivalent to a steadily inward flux boundary driven.

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