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Traditionally, two basic models of magnetic reconnection have been discussed in the framework of resistive magnetohydrodynamics (MHD): Fast Petschek reconnection and slow Sweet--Parker reconnection. However, the former requires a localized profile of the electric resistivity. The latter is free from such an assumption, but it is too slow to explain reconnection events in the plasma universe.

Recently, it has been found that Sweet--Parker reconnection switches to plasmoid-dominated turbulent reconnection due to the generation of secondary plasmoids. As a result, the reconnection rate remains moderately fast ($R \sim 0.01$) in realistic parameters, in which the conventional Sweet--Parker reconnection is too slow. This transition is analogious to a transition from a laminar flow to a turbulent flow in fluid dynamics.

Both Sweet--Parker and plasmoid-dominated models usually assume the incompressibility as a first step to understand the mechanism. At present, the role of the compressibility in these systems remains unclear.

The compressible fluid effects are pronounced in a low-beta plasma, in which the typical speed of the system or the typical Alfven speed exceeds the local sound speed. As extreme examples of compressible effects, recent MHD simulations revealed various shock-structures in low-beta reconnection (Zenitani & Miyoshi 2011, Zenitani 2015).

In this contribution, we will report our initial results on the basic properties of plasmoid-dominated turbulent reconnection in a low plasma beta. We discuss the role of the compressible parameters on the global reconnection rate and fine structures around the plasmoid islands. We will also discuss numerical issues in our HLLD/HLLC type MHD code.

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