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Dependence of Properties of the Tearing Mode on the Lundquist Number and the Background Environment

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We perform a set of 2D MHD simulations of the magnetic reconnection process in a long current sheet (CS) developed in the solar eruption, and studied the properties of the CS. The configuration is line-tied to the bottom boundary and open at the other sides. The energy conversion process depends not only on the magnetic Reynolds number, R_m, of the background, but also on the density and the gas pressure inside the CS. The high plasma density and pressure inside the sheet prevents reconnection from taking place quickly. In reality, on the other hand, the CS forms in the disrupting magnetic field and either density or pressure inside may not be high, as suggested by the coronal dimming observed during the early stages of eruptions. This allows fast reconnection to occur in our simulations of solar flares. Further investigations indicate that the time it takes for the first plasmoid to form in the CS increases with the value of R_m, and that the corresponding height decreases.

キーワード: Flares, Magnetic reconnection, Current sheet, Plasma instabilities, Turbulence, Fine structures
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