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Plasmoid Instability in Evolving Current Sheets and Onset of Fast Reconnection[1] YI-MIN HUANG, LUCA COMISSO, AMITAVA BHATTACHARJEE, Princeton University — A proper description for the onset of the plasmoid instability must incorporate the evolving process of the current sheet, as a high Lundquist number current sheet usually breaks apart before it approaches the Sweet-Parker width. We carry out two-dimensional simulations and theoretical analysis of the plasmoid instability in an evolving background. The plasmoid instability disrupts the current sheet and enters nonlinear regime when the sizes of plasmoids become comparable to the inner layer width of the tearing mode. The linear growth rate, current sheet width, and dominant wavenumber at current sheet disruption depend on not only the Lundquist number, but also the initial noise amplitude. The scalings obtained from simulations can be reproduced with a phenomenological model, which incorporates the effects of linear growth and advective losses due reconnection outflow. Our model predicts a critical Lundquist number below which disruption does not occur. The critical Lundquist number is not a constant value but has a weak dependence on the noise amplitude.

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