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**Role of the Plasmoid Instability in the Onset of Fast Reconnection** YI-MIN HUANG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire, A. BHATTACHARJEE, BRIAN P. SULLIVAN, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — The problem of fast magnetic reconnection in high-Lundquist-number ($S$) plasmas has been an active research topic for several decades. The main challenge is to explain why reconnection in nature or laboratories, such as solar corona and fusion devices, can proceed so quickly from a relatively quiescent state when the plasma involved is highly conducting. The classic Sweet-Parker theory based on resistive MHD predicts a reconnection rate that scales as $S^{-1/2}$. For many systems of interest, the resulting Sweet-Parker reconnection rates are much slower than those observed. Recent work has demonstrated that there is a fundamental flaw in the Sweet-Parker argument. When the Lundquist number exceeds a critical value, the Sweet- Parker layer is unstable to the plasmoid instability. Moreover, the plasmoid instability becomes more unstable the higher the Lundquist number is. Within the framework nonlinear resistive MHD, the plasmoid instability realizes a recooonection rate that is insensitive to the value of $S$. We will present our recent progress in understanding the effects of this instability on resistive and Hall MHD reconnection. In particular, we will discuss the role of the plasmoid instability in triggering Hall reconnection. We will present scaling relations on the reconnection rate, current sheet thickness, and the numbers of plasmoids.

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