The reconnection rate in driven reconnection

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One of the key questions in magnetic reconnection is what determines the reconnection rate. We investigate this question using resistive MHD simulations to study two scenarios: (a) reconnection driven by an external perturbation ("Newton challenge) and (b) reconnection driven by an internal MHD instability (island coalescence). The common result is that in either case the dissipation (resistivity) and the amplitude of the driving affect the maximum reconnection rate. The determining quantity in the Newton challenge problem, however, is the amount of added magnetic flux, rather than the magnitude of the applied electric field. Although we find nearly linear relations between the maximum driving electric field and the maximum reconnection rate, the factors are typically less than unity and depend on the dissipation. Also the maximum reconnection rate lags behind the maximum driving electric field by various amounts that also may depend on the dissipation. And the time profiles of driving and reconnection electric fields may differ substantially.