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Scaling of Hall Reconnection in the Coalescence Problem in Large Systems[1] JONATHAN NG, AMITAVA BHATTACHARJEE, YI-MIN HUANG, PPPL and Center for Heliospheric Physics — As collisionless reconnection modeling of most space plasmas with realistic parameters is beyond the capability of today's simulations, due to the separation between global and kinetic length scales, it is important to establish scaling relations in model problems so as to extrapolate to realistic scales. Large scale particle-in-cell (PIC) simulations of island coalescence have shown that the time averaged reconnection rate scales like $\sqrt{d_i/\lambda}$, where λ is the system size, while the maximum rate remains constant [1]. This differs from an earlier claim that reconnection rate is independent of system size [2] and predictions of fluid simulations and theory [3,4] that the maximum rate scales like $\sqrt{d_i/\lambda}$. We perform Hall MHD simulations with the same geometry to study this discrepancy. We find that when the scale separation between the current sheet width and ion skin depth is large enough, the maximum reconnection rate is constant and the average rate decreases weakly as system size increases, in contrast to the PIC results. The differences between PIC and fluid results are discussed.

[1] H. Karimabadi et al. PRL 107, 025002 (2011)
[2] M. Shay et al. GRL, 26, 2163 (1999)
[3] J. Dorelli, PoP 10, 3309 (2003)
[4] X. Wang et al. PRL 87, 265003 (2001)

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