ABSTRACT: It is well known that magnetic flux pileup can significantly speed up the rate of magnetic reconnection in high Lundquist number resistive MHD, allowing reconnection to proceed at a rate which is insensitive to the plasma resistivity over a wide range of Lundquist number. Hence, pileup is a possible solution to the Sweet-Parker time scale problem. Unfortunately, pileup tends to saturate above a critical value of the Lundquist number, $S_c$, where the value of $S_c$ depends on initial and boundary conditions, with Sweet-Parker scaling returning above $S_c$. It has been argued (see Dorelli and Birn [2003] and Dorelli [2003]) that the Hall effect can allow flux pileup to saturate (when the scale of the current sheet approaches ion inertial scale, $d_i$) before the reconnection rate begins to stall. However, the resulting saturated reconnection rate, while insensitive to the plasma resistivity, was found to depend strongly on the $d_i$.

In this presentation, we revisit the problem of magnetic island coalescence (which is a well known example of flux pileup reconnection), addressing the dependence of the maximum coalescence rate on the ratio of $d_i$ in the "large island" limit in which the following inequality is always satisfied: $l_\text{eta} \ll d_i \ll \lambda$, where $l_\text{eta}$ is the resistive diffusion length and $\lambda$ is the island wavelength.
