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Onset of collisionless magnetic reconnection in two-dimensional current sheets and formation of dipolarization fronts[1] MIKHAIL SITNOV, JHU/APL, MARC SWISDAK, University of Maryland, College Park — The onset of reconnection caused by the thinning of 2D current sheet equilibria with an X-line separating tail-like regions with magnetized electrons is simulated using a PIC code. For the case of tearing-stable tails, the electric field penetrates into the sheet near the X-line and forms there the electron diffusion region. In contrast, in multiscale current sheets, where the X-line is framed by local areas of enhanced magnetic flux, the electric field avoids the X-line, penetrates directly into those areas and ejects their plasma and magnetic flux, forming dipolarization fronts (DFs), sharp magnetic pileup structures, moving with plasma outflows in the direction opposite to the initial magnetic field stretching. New X-lines with their electron diffusion regions form behind DFs and away from the original X-line, which transforms eventually into the O-line. Simulations with a reduced driving electric field suggest, that the DF formation has properties of the ion tearing instability, and it is consistent with its predicted potential destabilization in multiscale current sheets. Weak driving of equilibria with tearing-stable tails first forms flux accumulation regions, similar to the ones adopted in multiscale equilibria, which then undergo rapid transformation to DFs, making 2D equilibria inherently metastable.

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