Fast Reconnection in Electron-Positron Plasmas[1] N. BESSHO, A. BHATTACHARJEE, University of New Hampshire — We present 2D studies of magnetic reconnection in electron-positron (or pair) plasmas in which there is no equilibrium guide field, using an electromagnetic particle-in-cell code. In the generalized Ohm's law for pair plasmas, the Hall term is absent because of an exact cancellation that occurs due to the equality of electron and positron masses. Hence, there are no whistler waves. We demonstrate that fast reconnection can be realized even in such a case, which breaks the link between fast reconnection and dispersive whistler waves. The quadrupolar structure of the out-of-plane magnetic field, which is often used as a signature of collisionless reconnection, is absent in pair plasmas. We show that the off-diagonal terms in the pressure tensor for both electrons and positrons are dominant in the generalized Ohm's law, that they are localized in the diffusion region, and that such localization is key to fast reconnection. The pressure tensors and inertial terms produce essentially a large effective resistivity in the diffusion region, which facilitates the formation of an X-point and realizes fast reconnection.

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