The Effect of Magnetic Islands Coalescence on Electron Acceleration during Magnetic Reconnection

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Production of high energy electrons is one of the most interesting topics in space plasma physics. In the Earth's magnetosphere, magnetotail reconnection has been thought to be a generation mechanism of the observed energetic electrons. However, the detailed electron acceleration mechanism in magnetic reconnection still remains an open question. We have shown that magnetic island coalescence subsequent to the tearing instability can efficiently accelerate electrons using two dimensional PIC simulations. To identify what are the dominant control parameters for the electron acceleration, we carried out a series of simulation runs changing various parameters, such as, the current sheet thickness, the mass ratio, the spatial size of the simulation box, the magnetic islands size, and the number of the initial magnetic islands. All the results show that the reconnection electric field at around the X-line greatly accelerated electrons during magnetic islands coalescence, and we found that electron energy spectra mainly depend on the spatial size of the simulation box at the final state.