Electron acceleration at reconnecting X point by electrostatic waves

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The electron acceleration at reconnecting X point by perpendicular propagating electrostatic waves in the collisionless magnetic reconnection is investigated using analytical solution and test particle simulation. These electrostatic waves are excited by plasma instabilities during the reconnection. It is found that the electron, which is trapped in the potential of electrostatic waves, can be accelerated effectively in the x direction of reconnection plane (x, z) only in the condition of parameter $G > 0$ is satisfied. The acceleration will discontinue up to the electron de-traps from the wave potential or escapes from the z boundary of magnetic reconnection. The maximum velocity of acceleration electron is nearby the electric drift velocity, it is proportional to the amplitude of electrostatic waves. The superposed longitudinal magnetic field along the direction of wave propagating is favorable for the electron acceleration.