Ion and electron accelerations during magnetic reconnection

Masahiro Hoshino[1]
[1] University of Tokyo

The acceleration of nonthermal particle in collisionless plasma has been a long standing puzzle. Magnetic reconnection is known to be one of important acceleration processes, yet the acceleration efficiency of ions an electrons in reconnection is not clearly understood. For example, the satellite observations in the Earth's magnetotail reported many efficient electron acceleration events during the plasma sheet crossing in reconnection, but the ion acceleration events associated with nonthermal ions are few. Furthermore, recent particle-in-cell (PIC) simulation results performed by several researchers also suggested the efficient acceleration for electrons but less acceleration for ions during reconnection. In this study, we investigate how and where the ions and electrons are acceleration during reconnection by using two- and three-dimensional PIC simulations. Specifically, we focus on the effect of the so-called driven reconnection with an external Poynting flux injection into the plasma sheet. We also pay a special attention to the coupling between reconnection and the lower hybrid drift instability (LHDI). Based on our simulation results, we discuss that (1) the electron acceleration can be enhanced by the coupling to LHDI in reconnection, and (2) the reconnection can generate quite a few nonthermal ions and electrons under the driven reconnection.