Computer studies on the three-dimensional magnetic reconnection with the superimposed By B_y Component

이은상 · 민경욱
한국과학기술원 물리학과

Three-dimensional magnetic reconnection is studied using magnetohydrodynamic simulations. The initial configuration is based on the two-dimensional Harris neutral sheet model which lies in the xz plane, and is extended in the y direction. Localized anomalous resistivity is applied to the central region and the subsequent evolution of spontaneous magnetic reconnection is observed. A special attention is given to the results with a finite By superimposed on the Harris model. Significant changes are seen in the system structure when the By component causes asymmetries. The reconnected field lines are skewed and the plasma flows, shock structures, and the current flows show peculiar asymmetries. Plasma sheet is also seen twisted. The reconnection region becomes broader and the strength of the current sheet grows more as By increases. Hence, the energy conversion is more significant when By is large. Also, the reconnection rate becomes greater for the larger extent of the diffusion region. The present study might be relevant to the geomagnetotail influenced by the interplanetary magnetic field with non-zero By component.