

A study on three-dimensional magnetic reconnection: B_y -effects

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We have performed three-dimensional MHD simulations of magnetic reconnection in a current sheet. In this study, the B_y component (the component in the current direction) is added to the Harris current sheet having anti-parallel field in the B_x component ($z=0$ defines the current sheet plane). The reconnection region centered at $y=0$ has finite extent in the current (y) direction and thus is a three-dimensional situation.

The effects of the B_y component on the jet produced by the three-dimensional reconnection are studied. The B_y component makes the reconnected field lines

and the jet meridian plane to be slanted from the current sheet normal direction (z axis). When the B_y component is zero, the outflows from the flanks of the jet is mostly along the current sheet. The outflows push the current sheet plasma aside in the y direction. The outflows in the presence of non-zero B_y are directed normal to the slanted jet meridian plane and thus have components in the z direction. As such, the outflows blow the current sheet plasma

in the z direction as well. The outflows at the leading edges of the jets result in helical streamlines that propagate in the directions of the reconnected field lines. Implications of these effects by the B_y component in a three-dimensional situation will be discussed.