Relativistic effects on magnetic reconnection

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Generally, it is thought that most of the spin-down energy power of a pulsar is carried away in an MHD wind dominated by Poynting flux. In the case of an oblique rotator, it is capable to suggest that pulsar wind is dissipated by magnetic reconnection. Magnetic reconnection process is also recognized as a great importance in high-energy astrophysics, such as black hole magnetospheres, and probably relativistic jets in Active Galactic Nuclei and Gamma Ray Bursts.

Our purpose is to investigate relativistic effects on magnetic reconnection to apply for high-energy phenomena in future. For that purpose, we carry out numerical simulations of Petschek-type magnetic reconnection using relativistic resistive magnetohydrodynamic code. We find that the outflow velocity reaches the Alfven velocity in the inflow region and that a higher Alfven velocity provides a higher inflow velocity. However, there is an upper limit for the inflow velocity and it does not approach the speed of light. This is because in the outflow, Lorentz contraction is compensated by a small angle between the slow shocks.