Dependence of electron dynamics on reconnection layer structure with density asymmetric current sheet

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Magnetic reconnection in the plasma universe is widely known as one of the important processes by which electromagnetic energy is converted into plasma kinetic/thermal energy. The existence of fast plasma outflows in association with the magnetic reconnection has been observed both in the magnetopause (MP) and in the magnetotail (MT). Structure of the MP is completely different from that of the MT. In the MP, the plasma density of the magnetosheath side is higher than that of the magnetospheric side. On the other hand, in the MT, the plasma densities of the northern and the southern hemisphere are usually thought to be symmetric. In the present study, we have investigated the dependence of the electron dynamics on a reconnection layer structure with density asymmetric current sheet. Two-dimensional (2-D) particle-in-cell (PIC) simulations with GEM-like perturbations have been used to see the nonlinear phase of the tearing mode. In order to do this survey, two key parameters of n_{low} and n_{high} are systematically varied, where n_{low} and n_{high} are the plasma densities at each lobe side. One asymmetric current layer (n_{lobe} = n_{low}, n_{high}) is compared to two different symmetric current layers. These are the current layers with low lobe plasma density (n_{lobe} = n_{low}, n_{low}) and with high plasma density (n_{lobe} = n_{high}, n_{high}). It is found that the asymmetric case cannot be explained by a simple superposition of symmetric calculations of high- and low-lobe plasma density. It is also found that the electron energization is controlled by the high density lobe plasma.