System Size Dependence on Magnetic Reconnection in Two-dimensional Full-particle Simulations

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Magnetic reconnection is one of the most important processes in space plasma physics. Up to the present, magnetic reconnection has been investigated by a lot of numerical simulations with various parameters. Key issues of the magnetic reconnection are when the magnetic reconnection is initiated, and how large the saturation level elevates. While they seem to be very sensitive to the system size of the simulation, and to be critical in the context of the fundamental reconnection process, the effects of the system size on the reconnection activity have not been studied yet. In this presentation, we will report the relationship between the spatiotemporal development of the X-line and the resulting global structural changes, such as reconnected flux, and outflow jet, using two-dimensional magnetotail-like full-particle simulations. We set the ion-to-electron mass ratio mi/me = 100 and the initial half-thickness of the current sheet D = 1.0d (d: ion inertial length), and we vary the system size up to ˜100d. We have clarified that during the reconnection phase, the reconnected flux and the extent of the ion outflow jet do not linearly increase, as the system size is enlarged. We will conclude that there is a critical length, above which the reconnected flux insignificantly grows.