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Development of the Plasma Particle Simulation Code wiht an Improved Open Boundary Model

Hiroki Hasegawa[1*], Tetsuya Sato[2]

[1]JAMSTEC, [2]University of Hyogo

An open system one-dimensional electrostatic particle code which adopts the new constant current generator model has been developed.
In general, a number of plasma particle simulations have adopted periodic or reflective boundary conditions for particles. However, those boundary conditions confine calculable physical phenomena strictly. Therefore, Sato et al. [1] developed an open system one-dimensional code that adopts the constant current generator model [2] and showed that super ion-acoustic double layers of which the electric potential difference can exceed ten times of the electron thermal energy are formed in an open system where a constant electron flow is supplied continuously.
However, when the electron drift velocity is comparable to or larger than the electron thermal velocity, a calculation by a code which adopts the original constant current generator model fails frequently. Thus, in the present study, we develop an improved open boundary model which makes computations free from the above problem. In this new model, the contribution of the ion flux which is not considered in the original model is added into the electric current. In this paper, we will also show some results of examinations of the new code.

[1] T. Sato et al., Phys. Plasmas, 2(10), 3609-3613 (1995).
[2] H. Takamaru et al., J. Phys. Soc. Jpn., 66(12), 3826-3830 (1997).

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