

2次元衝撃波静止系粒子コードの開発

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Two-dimensional shock-rest-frame model for particle simulations.

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A two-dimensional shock-rest-frame model for particle simulations is developed. This model does not need a huge simulation domain in the propagation direction of the shock wave as previous simulation models do. We performed a two-dimensional full particle simulation of a perpendicular collisionless shock and compared with one-dimensional simulation results. In both simulations, the excited shock waves show almost the same time evolution, periodically reforming at the timescale of the downstream ion gyro-period.

In the two-dimensional simulation, electrons are thermalized along the transverse magnetic field, and electromagnetic whistler mode waves are excited in the shock front region. The amplitude of the excited whistler mode waves is not so strong and the shock magnetic field keeps almost one-dimensional structure. The two-dimensional simulation also shows the absence of electrostatic solitary structures in the shock foot region, which is necessary for electron shock surfing acceleration.