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Co-evolution of upstream waves and accelerated particles around parallel shocks

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We have investigated the co-evolution of upstream waves and the accelerated particles around the parallel shock. Hybrid particle simulations are performed in the exactly parallel shock configuration with Mach number of ˜10. The upstream waves convecting into the shock surface contribute the particles acceleration as reported in Sugiyama et al. (2001). The appropriate wave-length exists for the particle energization, that is, the longer wave-length wave leads the higher energy particles. Simultaneously, the higher energized particles excite the longer wave-length waves in the upstream region. Here we report that the higher energy particles and longer wave-length waves are observed as the time elapses later in the simulation runs. Therefore, the present process is ”co-evolution” of the upstream waves and accelerated particles.

Keywords: collisionless shock, particle acceleration, wave-particle interaction