Geophysical Research Abstracts
Vol. 15, EGU2013-6748, 2013
EGU General Assembly 2013

Sustainable particle injection at parallel shock

Tooru Sugiyama (1), Masaki Fujimoto (2), and Yuichi Hirokawa (1)
(1) Earth Simulator Center, JAMSTEC, Yokohama, Japan (tsugi@jamstec.go.jp), (2) JAXA, ISAS, Sagamihara, Japan

We have investigated the injection problem at collisionless shocks, especially in parallel shocks. As reported in Sugiyama et al. (2001, JGR), the injection process is strongly linked to the acceleration process from thermal to non-thermal energy. This process is confirmed in both a test-particle calculation and a self-consistent hybrid simulation. In the test-particle calculation, only the incoming thermal particles are picked up and accelerated at the shock surface. On the other hand, in the self-consistent hybrid simulation this process can be observed for not only thermal particles but also non-thermal particles of larger energy. In addition we observed a time dependency. In the early phase of the hybrid simulation, the upstream Alfven waves can pick up only the lower energy particles. In the later phase, the upstream Alfven waves can pick up both lower and higher energy particles and further accelerate these particles. This time dependence comes from the change of the wave spectrum in the upstream region, where the wave length gets longer in time. The important point is that the further accelerated particles excite the waves with a longer wave length. That is, the characters are changed by the particles accelerated/produced by shock itself. Therefore, we call the present process as “sustainable” injection.