Geophysical Research Abstracts, Vol. 9, 06402, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06402

An expectation for the Cross-Scale/SCOPE missions: Collisionless shocks

I. Shinohara(1), Y. Kasaba(1), M. Fujimoto(1), M. Oka(2), S. Matsukiyo(3), Y. Seki(1), N. Shimada(1), T. Sugiyama(4), K. Tsubouchi(5)

(1) ISAS/JAXA, (2) Kyoto Univ., (3) Kyushu Univ., (4) ESC/JAMSTEC, (5) NICT

Collisionless shocks are commonly observed in the Universe, e.g. supernova-remnants, stellar winds, galactic jets, etc. They are believed to play important roles for plasma heating and deflecting plasma flows, and particle acceleration in space plasmas. In this talk, we raise key questions that we should pursue for a coming era of Cross-Scale/SCOPE multi-spacecraft missions. Essential questions regarding collisionless shock physics are: - How is upstream energy partitioned by collisionless shocks? - How do collisionless shocks form their structure responding to upstream? In the context of cross-scale coupling views, production processes of non-thermal electron are an illustrative problem. Recent results from computer simulation studies show that ion dynamics can be highly modulated by electron scale phenomena and that electron dynamics plays an important role in collisionless shock energy dissipation. As a result of plasma instabilities excited in the shock transition layer, some electrons are accelerated and form the non-thermal part of the electron energy distribution. Thus, understanding the generation mechanism of non-thermal particles is one of keys both to solve the energy partition and the shock-formation problems. However, in the present knowledge, the role of the non-thermal particles in the shock energy dynamics is still obscure. To address this issue empirically, we should identify where the non-thermal electrons are produced and trace how the non-thermal electrons behave in the multi-dimensional shock structure under various upstream plasma conditions. The Cross-Scale/SCOPE missions will provide us with such definitive information.