

Spacecraft environment simulation with full-particle ES code modeling of the REIMEI satellite observation

Hiroko, O Ueda[1]; Masaki Okada[2]; Hideyuki Usui[3]; kojiro Imasato[4]

[1] JAXA; [2] NIPR; [3] RISH, Kyoto Univ.; [4] RISH, Kyoto Univ.

We have analyzed the charging of REIMEI satellite using an electrostatic full particle-in-cell (PIC) code derived from the numerical space chamber (NuSPACE) which is originally capable of performing the electromagnetic plasma particle simulation on highly parallel supercomputers. A realistic spacecraft charging can be simulated by the code not only for studying the geospace environment but also for study of spacecraft electrostatic modeling.

The small scientific satellite REIMEI launched on August 24, 2005, flies at an altitude of 620km to 670km in the sun-synchronous polar orbit. It is equipped with an aurora camera, two auroral particle sensors for electrons and ions, one single-probe and two double probes for the plasma-current monitors (CRM) designed for high-time/spatial resolution measurements. The environment plasma parameters have been given by the Langmuire curves of CRM under the aurora particles precipitation. These results will give feedback for satellite charging analysis as well as future satellite designs.

We have performed two test simulations for confirming the numerical accuracy, comparing with both the chamber experiment and in-situ observation with CRM on the orbit. Therefore, comparing with results of the multi-utility spacecraft charging analysis tool (MUSCAT) which is based on particle tracking method combined with PIC will be significant as for validation of MUSCAT.