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Space vehicles immersed in space plasma are generally charged to certain potentials, which usually depend on the local plasma temperature and exposed material properties. Generally speaking, the spacecraft running in low earth orbit will experience weak surface charging due to the fact that the low earth orbit pass through the ionosphere, which is composed of dense and cold plasma with typical electron temperature of 0.2 eV. However, application of high voltage solar arrays can induce significant spacecraft charging in some situations, two typical charging events, rapid charging and normal charging, have been observed on international space station, both of which are induced by the interaction of high voltage solar arrays with space plasma and occur at exit from eclipse. For the rapid charging, with typical spikes of floating potential up to 70 volts have been observed frequently in the international space station. Such a charging situation is threatening to the safety of the space station. In this paper, the spacecraft charging driven by high voltage solar arrays is modeled. The results show that the rapid and normal charging are two different stages of the same charging process. The rapid charging, the initial stage, is a non-equilibrium charging driven by the sudden solar panel voltage switch-on at eclipse exit, in which case the charging of the cover glasses by the ambient plasma can't respond quickly enough to block the electron collection by the solar arrays effectively. As the charging reaches equilibrium, it displays as a normal charging event with smaller floating potential. The characteristics and trends of both the rapid and normal charging are presented by calculation with international space station configurations and the results agree well with observations.

Biography

Jianguo Huang has completed his PhD from Institute of Physics, Chinese Academy of Sciences. He is the Senior Expert of Spacecraft Environment Engineering, member of expert database of Ministry of Science and Technology, China and referee expert of China Natural Fund Committee. He mainly specializes in space environment and its interaction with spacecraft. He has published more than 70 papers in reputed journals and has been serving as an Editorial Board Member of several academic journals.

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