Development of an estimation method of spacecraft surface potential for a real-time spacecraft risk assessment

Ryota Kawachi[1], Tsuyoshi Teraoka[1], *Masao Nakamura[1], Tsutomu Nagatsuma[2], Mamoru Ishii[2]

1. Osaka Prefecture University, 2. National Institute of Information and Communications Technology

Spacecraft anomalies are often induced by surface charging and resultant discharging arcs. We are developing a quick estimation method of spacecraft surface potential for the Space Environment Customized Risk Estimation for Spacecraft (SECURES) of the space weather forecast Project for Solar-Terrestrial Environment Prediction (PSTEP). We create lookup tables of the surface potential of the target spacecraft for combinations of plasma temperatures and densities using a spacecraft charging analysis software in advance and/or observational results. By interpolation from the lookup tables, we can estimate the surface potential on demand for any given on-orbit plasma environment. The spacecraft risk assessment can be accomplished by additional information about the experimental discharging differential potential of the surface materials. We will introduce the current status of development of our method.

Keywords: Spacecraft surface charging, Space weather, Spacecraft risk assessment

