

Toward mitigating space weather risk of individual spacecraft in geospace

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There are numbers of commercial satellites operated in geospace. These satellites sometimes faced on the hazardous conditions because of geospace disturbances. Dynamic change of the particle environment surrounding individual satellite causes spacecraft charging/discharging problem. Less than 100 keV energy of charged particles, and more than 500 keV energy of charged particles cause surface and internal charging to satellites, respectively. Spacecraft charging is one of the major reason of spacecraft anomaly. To mitigate the risk of satellite anomaly, prediction of middle to high energy particle environment in geospace is important, because satellite operators can avoid critical operation if they know the exact risk of satellite anomaly in advance. Further, if the satellite operator understands the current condition of space environment surrounding individual satellite, they can quickly judge initial triage to solve the problem of satellite anomaly. Thus, nowcasting and forecasting of space environment around individual satellite is important.

However, the risk of satellite anomaly is also depending on the specification of individual satellite (e.g. surface materials, radiation tolerance, etc.). Therefore, tailor-made space weather information and risk assessment for individual satellite is needed. To estimate a risk of spacecraft charging for individual satellite, we are combining forecasting model of space environment and engineering model for individual satellite. Based on the combination of these models, we will provide specific information of charging risk for individual satellite. In this presentation, we will introduce current status of our project.

Keywords: space weather forecast, satellite anomaly, risk mitigation