

Relationship between geosynchronous satellite charging and space environment

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In the social life accompanying rapid social development what depends the improvement in the convenience on satellites are large, and many satellites are going around the near earth. The space weather is various, the thing especially about employment of satellites, solar flare, solar wind, magnetic storm, galactic cosmic ray, etc. are raised. Prediction of space weather and research of evasion of danger are advanced.

It is called a "space weather forecast." Moreover, the system of catching the space environment correctly and supervising it in order to perform activity in the universe safely is indispensable, and in order to employ safely the satellite which requires a large amount of expenses for development and employment, the space weather forecast for the satellite has been an important issue. The influence of the global environment on a solar activity changes greatly with kinds of satellites, it pays its attention about the obstacle of a geostationary orbit satellite in this research.

Relationship between space environment and surface charging of geosynchronous satellite was investigated using the Potential monitor (POM) onboard ETS-V. In analyzing, the orbit condition of ETS-V and changes of the operation mode changes the condition of spacecraft charging, we try to remove these effects before our data analysis. As a result, we found that the surface charging of satellite is frequently occurred during 00LT and 06LT. It is thought that it is based on the photoelectric effect discharged by hitting light on the satellite surface and extensive electron injection by a substorm.

Next, we assume that the extensive electron injection by the substorm can be measured by AL index. Therefore, we investigated about the relationship between surface charging phenomena and AL index.

Correlation between spacecraft charging and AL index is not good in general. However, weak correlation is seen only in the time zone between 00LT and 06LT. This result seems to be related to the partial ring current by a substorm. Moreover, we were investigated whether the start time of satellite charging and the rapid growth of AL index are correlated. A result, 120 events of satellite charging is identified. 66 events are well correlated. About half of the events do not show clear correspondence.

Keywords: Space Weather Forecast, Satellite Charging, Substorm, Geosynchronous Satellite