

SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)

Author: Mr. Satoshi Furuta
Kyushu University, Japan, furusato@aero.kyushu-u.ac.jp

Prof. Toshiya Hanada
Kyushu University, Japan, hanada.toshiya.293@m.kyushu-u.ac.jp

Dr. Koki Fujita
Kyushu University, Japan, fuji@aero.kyushu-u.ac.jp

Mr. Kazuki Takezono
Japan, k-takezono@aero.kyushu-u.ac.jp

DISCUSSION ON THE NECESSITY OF ORBITAL DEBRIS REMOVAL IN THE GEOSTATIONARY
REGION**Abstract**

The geostationary region is a unique natural resource that is useful for mankind activities. The collision probability in the geostationary region is relatively low compared to the low Earth orbit region. However, there is a fact that collision-avoidance maneuver has been performed often. Cataloged debris in the geostationary region are grouped into two major classes: (1) librating objects, and (2) drifting objects. The former ones are librating around the eastern longitude of 75 degrees, western longitude of 105 degrees, or both longitudes, known as stable points. The latter ones move eastward or westward as observed from the ground. Especially, librating objects periodically approach to operational spacecraft. If accidental collisions take place in the geostationary region, then space communities would suffer great inconveniences. Therefore, it is necessary to assess collision risk in the geostationary region. As an evaluation method for the collision probability, Kyushu University has developed GEODEEM, an orbital debris evolutionary model, that simulates prolonged debris environment in the geostationary region. GEODEEM calculates the time averaged probability of collision of a spacecraft with debris. This method cannot properly characterize the librating objects periodically approaching operational spacecraft because the actual position of debris is not considered. Instead, this study adopts “Conjunction Analysis” so that the relative distance between a spacecraft and debris is computed to evaluate the collision probability at the time of the closest approach. Our research has two goals. One is to evaluate the probability of collision between a spacecraft controlled to stay at a specified longitude slot and uncontrolled neighbors using “Conjunction Analysis”. The other is to develop a new orbital debris evolutionary model in which “Conjunction Analysis” is incorporated to select debris to be removed. Currently, the probability of collision of a spacecraft with debris has been calculated, so that this paper will show some interesting results in terms of orbital debris removal in the geostationary region.