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SPACE ENVIRONMENTAL EFFECTS FOR A SPACE SITUATIONAL AWARENESS MISSION IN SUB-GEO

Abstract

The geostationary ring hosts the most valuable set of commercially owned space assets to date, therefore precise space situational awareness (SSA) data on this region are of high interest. Observation capability for objects in geostationary orbit (GEO) from the ground is limited due to the large distance and required favorable weather conditions for optical observations. A proposed space situational awareness mission in sub-GEO orbit would overcome these limitations and would be able to provide accurate and timely object detection and tracking as well as object characterisation. The space environment between MEO and GEO altitudes is characterized by a harsh radiation environment due to the outer Van Allen radiation belt. As the region is only scarcely utilized by satellites so far, the space debris population is supposedly less hazardous, yet very little in-situ data is available for characterizing the environment. The importance of this region will grow with the increasing number of satellites reaching GEO through electric orbit raising and thereby spending extended time in this region. The primary SSA mission payload, in addition to observing debris bigger than 10 cm in the GEO ring, will enable the detection and statistical analysis of debris in the mission orbit down to the mm range. By also hosting a radiation monitor and a microparticle impact detector highly valuable data on the space environment in this region could be collected allowing for better environmental modelling. A study of the current understanding of the space environment and its effects on spacecrafts in sub-GEO orbit will be presented together with an overview of the proposed SSA mission and its potential for new in-situ observations.