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

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GEOSYNCHROUS ENVIRONMENT FOR ORDEM2008

Abstract

The new version of the NASA Orbital Debris Engineering Model (ORDEM2008) requires accurate populations as input template files to be used in the calculation of orbital debris fluxes on chosen spacecraft or within telescope/radar fields-of-view. Populations in ORDEM2008 are derived from a consortium of data and modeling. Geosynchronous (GEO) satellites and debris form a distinct ORDEM2008 population that is applied to the distinct analysis of GEO fluxes. Low Earth orbit (LEO) populations are derived by combining modeling results with ground-based data, primarily from radar systems and in-situ data. In contrast, the GEO region has not been as well observed. The distance between orbiting objects and ground-based instruments precludes the wide usage of radar as a means of observation. Instead, optical instruments dominate in the study of GEO. Of these, the NASA sponsored Michigan Orbital Debris Survey Telescope (MODEST) has provided 4 years of surveys of the region detecting cataloged objects (correlated targets) and non-cataloged objects (uncorrelated targets) to an estimated minimum size of 30 cm.

This paper describes the methods of combining NASA launch database and satellite breakup and orbital propagation modeling with MODEST 2004-to-2006 uncorrelated target data to attain a GEO environment to 10 cm. Assuming that MODEST uncorrelated targets are breakup debris allows for the extension of the debris survey data to smaller sizes with the NASA Standard Breakup model. Each orbit within the total resulting GEO population is marked by a random argument of perigee and nearly constant mean anomaly, eccentricity, inclination, and node over the nearly 3 years of observation. Lack of published references of past breakups in GEO is mitigated by the orbital propagation of MODEST extended data to 1995 (the beginning epoch of ORDEM2008).