SPACE DEBRIS SYMPOSIUM (A6)
Measurements (1)

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TIME-RESOLVED INFRARED SPECTROPHOTOMETRIC OBSERVATIONS OF HIGH AREA TO MASS RATIO (HAMR) OBJECTS IN GEO

Abstract

Optical surveys have identified a class of high area-to-mass ratio (HAMR) objects in the vicinity of the Geostationary Earth Orbit (GEO) ring*. The exact origin and nature of these objects are not well known, although their proximity to the GEO belt poses a hazard to active GEO satellites. Due to their high area-to-mass ratios, solar radiation pressure perturbs their orbits in ways that makes it difficult to predict their orbital trajectories over periods of time exceeding a week. To better understand these objects and their origins, observations that allow us to derive physical characteristics are required in order to improve the non-conservative force modeling for orbit determination and prediction. Information on their temperatures, areas, emissivities, and albedos may be obtained from thermal infrared, mid-wave infrared (MWIR), and visible measurements. Spectral features may help to identify the composition of the material, and thus possible origins for these objects.

We have collected observational data on various HAMR objects at the AMOS observatory 3.6 meter AEOS telescope. The thermal-IR spectra of these low-earth orbit objects acquired by the Broadband Array Spectrograph System (BASS) span wavelengths 3 to 13 m and constitute a unique data set, providing a means of measuring, as a function of time, object fluxes. These, in turn, allow temperatures and emissivity-area products to be calculated. In some instances we have also collected simultaneous MWIR and filtered visible photometric data on the observed objects. We describe briefly the nature and status of the instrumental programs used to acquire the data, our data of record, our data analysis techniques, and our current results, as well as future plans.

*Schildknecht, et al., "Properties of the High Area-to-mass Ratio Space Debris Population in GEO," AMOS Tech. Conf., Wailea, Hawaii, Sept, 2005.