SPACE DEBRIS SYMPOSIUM (A6)
Measurements (1)

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OPTICAL REFLECTION SPECTROSCOPY OF GEO OBJECTS

Abstract

We report on optical reflection spectroscopy of geosynchronous (GEO) objects in the US Space Surveillance Network (SSN) catalog. These observations were obtained using imaging spectrographs on the 6.5-m Magellan telescopes at the Las Campanas Observatory in Chile. Our goal is to determine the composition of these objects by comparing these spectral observations with ground-based laboratory measurements of spacecraft materials.

The observations are all low resolution (1 nm after smoothing) obtained through a 5 arc-second wide slit and using a grism as the dispersing element. The spectral range covered was from 450 nm to 800 nm. All spectra were flux calibrated using observations of standard stars with the exact same instrumental setup. An effort was made to obtain all observations within a limited range of topocentric phase angle, although the solar incident angle is unknown due to the lack of any knowledge of the attitude of the observed surface at the time of observation.

To date spectral observations of 13 GEO objects have been obtained on Magellan. We concentrated on pieces cataloged as debris in the SSN catalog, along with objects whose characteristics were known prior to launch:

• 5 pieces of debris from the Titan Transtage 3C-4 (1968-081) breakup in 1992: SSN 25000, 38690, 38691, 38699, and 38705.

• 4 other pieces of GEO debris: SSN 08832, 12996, 13753, and 29014.

• 1 piece of GEO debris whose pre-launch characteristics are known: SSN 29106, the MSG2 Cooler Cover.

• 3 Initial Defense Communications Satellite Program (IDCSP) satellites whose original surfaces were very simple (solar cells) and known prior to launch: SSN 02653, 02655, and 03287.

Preliminary comparisons have not shown a high correlation between telescopic and laboratory data, with the exception of a few objects. This paper will report on other factors that may skew the results for comparisons and what future work needs to be addressed.