New satellite drag modeling capabilities

Marcos F.A.

Air Force Research Laboratory, Hanscom AFB, MA 01731-3010; Space Vehicles Directorate, AFRL/VSBXT, 29 Randolph Road; AIAA

Abstract: This paper reviews the operational impacts of satellite drag, the historical and current capabilities, and requirements to deal with evolving higher accuracy requirements. Modeling of satellite drag variations showed little improvement from the 1960's to the late 1990's. After three decades of essentially no quantitative progress, the problem is being vigorously and fruitfully attacked on several fronts. This century has already shown significant advances in measurements, models, solar and geomagnetic proxies and the application of data assimilation techniques to operational applications. While thermospheric measurements have been historically extremely sparse, new data sets are now available from intense ground-based radar tracking of satellite orbital decay and from satellite-borne accelerometers and remote sensors. These data provide global coverage over a wide range of thermospheric altitudes. Operational assimilative empirical models, utilizing the orbital drag data, have reduced model errors by almost a factor of two. Together with evolving new solar and geomagnetic inputs, the satellite-borne sensors support development of advanced operational assimilative first principles forecast models. We look forward to the time when satellite drag is no longer the largest error source in determining orbits of low altitude satellites.

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Authors with affiliations:

1. Marcos, F.A., Air Force Research Laboratory, Hanscom AFB, MA 01731-3010, Space Vehicles Directorate, AFRL/VSBXT, 29 Randolph Road, AIAA