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ORBIT MAINTENANCE FOR A REPEATING GROUND TRACK CONSTELLATION

Abstract

Satellite altimetry missions play vital role in the ocean studies. They allow us to determine the current sea level, detect marine debris pathways, study the glaciers and have several other applications. There are several missions already launched, including Envisat and Jason satellite series, as well as currently operation Sentinel-3A/B and Sentinel-6. One of the main problems for such missions is orbit correction: in order to provide useful data, satellites must be placed on the orbits with repeating ground-tracks. Although we can design such orbits taking into account only the Earth gravity (e.g. in two-body problem or under the J2 perturbation), any external disturbance would lead to fast degradation of the orbit – in several days distance between the supposedly repeating ground tracks would become too large to gather useful data. Hence, the active orbital corrections are needed. In this paper we consider a problem of Low Earth Orbit (height of about 500 km) altimetry constellation maintenance. It consists of six satellites equipped with reactive thrusters for orbit corrections. We consider the effect of external disturbance such as higher gravity harmonics and atmospheric drag, and suggest a technique for maneuver calculation that allow us to preserve the repeating ground tracks.