

EARTH OBSERVATION SYMPOSIUM (B1)
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A DELTA-V MAP OF USEFUL ORBITS FOR EARTH OBSERVATION MISSIONS

Abstract

Remote sensing missions often requires synchronization with both celestial bodies and ground targets. For example, Sun-synchronous repeat ground tracks visit particular ground locations under identical illumination conditions, and tidal-synchronous repeat ground tracks visit particular locations under identical tidal conditions. These two types of orbits have periods that are synchronized by integer ratios with a sidereal day of 23.93 hours and a tidal lunar day of 24.84 hours, respectively. Although Sun synchronism and tidal synchronism cannot be simultaneously achieved in a strict sense, a careful choice of the repeat ratio and other orbital elements enables the two synchronisms to be nearly met or switchable with a minimum velocity increment (Δv). Another category of orbits to consider is a drifting orbit, whose ground track no longer repeats, but slowly drifts eastward or westward, which allows a satellite to follow and observe mobile targets such as hurricanes. This paper identifies the basic parameters of these important orbits and devises a Δv map amongst them, which aids future mission planning of multi-purpose Earth observation satellites or constellations.