

EARTH OBSERVATION SYMPOSIUM (B1)
Future Earth Observation Systems (2)

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ALTERNATIVE ORBITS TO GEOSTATIONARY FOR HIGH REVISIT

Abstract

As Earth Observation optical satellites have proven to be valuable for many applications in various domains such as environmental sciences, risks management and damage assessment, there has been a rising demand for more frequent observations combined with high spatial resolution.

LEO Sun Synchronous orbits that are often used for earth observation systems favour spatial resolution to the detriment of temporal resolution. When high temporal resolution is needed, geostationary systems or LEO constellations are usually the only ways that are considered to satisfy this requirement. LEO constellations enable high spatial and temporal resolution but require a high number of satellites, a feature that makes them costly, if one wants to reach a less than one day revisit. Geostationary systems present many well-known disadvantages for earth observation such as high observation distances, constant viewing angles and large observation zenith angles on medium latitudes.

In the context of the HRT (Haute Revisite Temporelle) phase 0 study at CNES, we have explored the domain of orbital configurations to look for orbits that would enable lower distance observations than geostationary positions and would enable Nadir observation on medium latitudes while preserving high revisit.

Elliptical orbits appear to offer short revisit intervals and persistence of observation at the vertical of the apogee. Critical inclinations allow to get a stable apses line and adequate combinations of semi major axis value and eccentricity allow to get sun synchronicity of the orbit plane.

Radiation environment has to be carefully taken into account as the MEO domain of altitudes might be prone to severe conditions.

In the framework of this presentation, we will show how to optimise orbital parameters with respect to criteria such as altitude, instrument complexity, geographical coverage and radiation environment.

Current studies conducted at CNES and involving industry address the design of optical high spatial resolution systems on such elliptical MEO SSO orbits.