Contribution ID: **54** Type: **poster**

ELXIS: a satellite to accurately measure general relativistic dragging effects

Wednesday, 20 February 2019 18:24 (1 minute)

Using a geocentric ecliptical coordinate system to analyze the data of a proposed new Earth's satellite, provisionally named ELXIS, in a circular orbit perpendicular to both the equator and the reference direction of the Vernal Equinox should allow, in principle, to measure the general relativistic Lense-Thirring and De Sitter effects on the satellite's inclination I and node Ω to a relative accuracy of $\simeq 10^{-2},\ 10^{-5}$, respectively. Indeed, the long-term perturbations on $I,\ \Omega$, referred to the ecliptic, due to the zonal harmonic coefficients $J_\ell,\ \ell = 2, 3, 4, 5, \ldots$ of the geopotential vanish for $e = 0,\ I = \Omega = 90\,\mathrm{deg}$. Departures $\Delta I = \Delta\Omega \simeq 0.01 - 0.1\,\mathrm{deg}$ from such an ideal orbital configuration would not compromise the stated accuracy goals. The most insidious competing perturbations are due to the ocean component of the K_1 tide of degree $\ell = 2$ and order $m = 1$: they do not vanish for $I = \Omega = 90\,\mathrm{deg}$, and our knowledge of its tidal height $C^+_{2,1,K_1}$ is relatively inaccurate. A suitable linear combination of the rates of change of $I,\ \Omega$ allows to cancel out them and enforce the De Sitter effect. By assuming a relative uncertainty of the order of $\simeq 10^{-3}$ in $C^+_{2,1,K_1}$ from a comparison of some rather recent global ocean tide models, the resulting systematic bias on each of the Lense-Thirring precessions would be at the percent level. Other sources of potential systematic uncertainties like the 3rd-body perturbations due to the Moon and the non-gravitational accelerations allow to meet the desired accuracy levels.

Summary

ELXIS is a concept study for a satellite-based mission to measure the De Sitter and Lense-Thirring precessions in the field of the Earth to a $\simeq 10^{-5}$ and $\simeq 10^{-2}$ relative accuracy, respectively.

Primary author: Dr IORIO, Lorenzo (MIUR-Istruzione)

Presenter: Dr IORIO, Lorenzo (MIUR-Istruzione)

Session Classification: Poster session

Track Classification: Gravity: Experiments