Abstract Submission

Intended Topic: Science and Analysis **Preferred type of contribution: oral**

Thermal Thrust Perturbations, Spin evolution and the long-term behavior of LAGEOS II Semi-Major axis

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Abstract

Understanding the effects of Non-Gravitational Perturbations (NGPs) has characterized the study of the dynamic model of LAGEOS satellites since their launch. These passive geodetic satellites, tracked by the Satellite Laser Ranging technique, are the most extensively studied so far in the literature for the development of ad-hoc perturbative models. Besides their significant applications in geodesy and geophysics, this is related to the numerous measurements and investigations that have characterized these satellites in the field of gravitational physics and the verification of the predictions of General Relativity. Among the numerous NGPs, thermal thrust forces arise as a consequence of a non-uniform distribution of temperature across the surface of the satellite. This temperature distribution is responsible for an anisotropic emission of radiation with also significant long-term effects on the orbital elements. These effects are produced by the pressure of solar and terrestrial radiations (albedo and infrared). The different importance of these forces, strictly influenced by the rotational state of the satellites — both in orientation and in rate — seems to be the main cause of the inversion observed in the decay of the semi-major axis of LAGEOS-II starting from mid-March 2012,

approximately 19 years after its launch. This behavior, apparently unexpected and far from its previous interpretation, will be described and discussed in light of the thermal thrust and spin models of the satellite that we have developed and compared with Precise Orbit Determination results. This research is part of a broader activity in the field of fundamental physics, aiming to use geodetic satellites as proof masses to test and compare the predictions of General Relativity with those of other alternative theories of gravitation, in the context of the project SaToR-G (Satellite Test of Relativistic Gravity).