Geophysical Research Abstracts
Vol. 19, EGU2017-13554, 2017
EGU General Assembly 2017

Earth gravity field modeling and relativistic measurements with laser-ranged satellites and the LARASE research program

Giuseppe Pucacco (1,2), David Lucchesi (3,2,4), Luciano Anselmo (4), Massimo Bassan (1,2), Carmelo Magnafico (3,2), Carmen Pardini (4), Roberto Peron (3,2), Ruggero Stanga (5,6), Massimo Visco (3,2)

(1) Dep. Physics, Tor Vergata (Roma), Italy, (2) INFN, Tor Vergata (Roma), Italy, (3) INAF/IAPS, Tor Vergata (Roma), Italy, (4) CNR/ISTI, Pisa, Italy, (5) Dep. Physics, Firenze, Italy, (6) INFN, Firenze, Italy

The importance of General Relativity (GR) for space geodesy — and for geodesy in general — is well known since several decades and it has been confirmed by a number of very significant results. For instance, GR plays a fundamental role for the following very notable techniques: Satellite-and-Lunar Laser Ranging (SLR/LLR), Very Long Baseline Interferometry (VLBI), Doppler Orbitography and Radio-positioning Integrated by Satellite (DORIS), and Global Navigation Satellite Systems (GNSS). Each of these techniques is intimately and closely related with both GR and geodesy, i.e. they are linked in a loop where benefits in one field provide positive improvements in the other ones. A common ingredient for a suitable and reliable use of each of these techniques is represented by the knowledge of the Earth's gravitational field, both in its static and temporal dependence. Spaceborne gravimetry, with the inclusion of accelerometers and gradiometers on board dedicated satellites, together with microwave links between satellites and GPS measurements, have allowed a huge improvement in the determination of the Earth's geopotential during the last 15 years. In the near future, further improvements are expected in this knowledge thanks to the inclusion of laser inter-satellite link and the possibility to compare frequency and atomic standards by a direct use of atomic clocks, both on the Earth's surface and in space. Such results will be also important for the possibility to further improve the GR tests and measurements in the field of the Earth with laser-ranged satellites in order to compare the predictions of Einstein's theory with those of other (proposed) relativistic theories for the interpretation of the gravitational interaction.
Within the present paper we describe the state of the art of such measurements with geodetic satellites, as the two LAGEOS and LARES, and we discuss the effective impact of the systematic errors of gravitational origin on the measurement of the relativistic precessions expected on some of the orbital elements of these laser-ranged satellites.