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ODYSSEY 2: A MISSION TOWARD NEPTUNE AND TRITON TO TEST GENERAL RELATIVITY

Abstract

Odyssey 2 will be proposed for the next call of M3 missions for Cosmic Vision 2015-2025. This mission, under a Phase 0 study performed by CNES, will aim at Neptune and Triton. Two objectives will be pursued.

The first one is the test of General Relativity at the solar system scale. Experimental tests of gravity have always shown good agreement with General Relativity. There are however drivers to continue testing General Relativity, and to do so at the largest possible scales. Theoretically, Einstein's theory of gravitation shows inconsistencies with a quantum description of Nature and unified theories predict deviations from General Relativity. From an observational point of view, as long as dark matter and dark energy are not observed through other means than their gravitational effects, they can be considered as a manifestation of a modification of General Relativity at cosmic scales.

The second objective is to enhance our knowledge of Neptune and Triton. Several instruments dedicated to planetology are under study: a magnetometer, an infrared mapping capability, an imaging capability and a dust and particle detector. Depending on the ones kept, the mission could provide information on the gravity field, the atmosphere and the magnetosphere of the two bodies as well as on the surface geology of Triton and on the nature of the planetary rings around Neptune.

Among other instruments, Odyssey 2 will take the Gravity Advance Package (GAP) on board. The GAP is a 3 axis electrostatic accelerometer, which measures the non-gravitational forces acting on the spacecraft. It is based on ONERA's experience (GRACE and GOCE missions). A bias rejection system has been added; it consists of a rotating stage which allows rotating the accelerometer and thus measure the bias of the accelerometer. With this technology, it is possible to achieve an accuracy of 10 pm.s-2 around DC. In order to fly on an interplanetary mission, it is also necessary to decrease the weight and consumption of the instrument with respect to previous accelerometers. A new configuration will allow reaching the target of 3 kg and 3 W for the entire instrument.

The presentation will give an overall description the Odyssey 2 mission, in term of trajectory and instruments on board. It will focus on the Gravity Advance Package which an instrument developed for this mission. Finally, an overview of the expected scientific return will be given.