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Small Bodies Missions and Technologies (4)

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ASTER: A BRAZILIAN MISSION TO AN ASTEROID

Abstract

The first Brazilian mission to an asteroid is being planned. The target is the asteroid 2001 SN263, which has a NEA orbit of class AMOR. Spectral analysis indicated that this is a C-type asteroid. This type of asteroids are dark and difficult to be studied from Earth. They hold clues of the initial stages of planetary formation and also the origin of water and life on Earth. In fact, radar data showed that 2001 SN263 is composed of three bodies with diameters of about 2.8 km, 1.1 km and 0.4 km. Therefore, the spacecraft will have the opportunity to explore three bodies on the same trip. The mission is scheduled to be launched in 2015, reaching the asteroid in 2018. It will be used a small spacecraft (150 kg) with 30 kg for the payload. The set of scientific instruments being considered to explore the target of this mission include an Imaging Camera, a Laser Rangefinder, an Infrared Spectrometer, a Synthetic Aperture Radar and a Mass Spectrometer. The main measurements to be made include the bulk properties (size, shape, mass, density, dynamics, spin state), the internal properties (structure, gravity field) and surface properties (mineralogy, morphology, elemental composition). The mission also opens an opportunity for some relevant experiments, not directly related to the target. Two such experiments will take benefit from being on board of the spacecraft along the journey to the asteroid system, which will take about three years. The first is an astrobiology experiment. The main goal of this experiment is to determine the viability of the microorganisms survival in extraterrestrial environments simulated in laboratory (chemical atmosphere, temperature, desiccation, vacuum, microgravity and radiation). The second experiment is a plasma package. The main objectives of this experiment are to study the structure and electrodynamics of plasma along the trajectory, the plasma instability processes and the density and temperature of plasma of solar wind origin along the trajectory and near the asteroids. This mission represents a great challenge for the Brazilian space program. It is being structured to allow the full engagement of the Brazilian universities and technological companies in all the necessary developments to be carried out. In this paper, we present some aspects of this mission, details of the payload that will be used, and the scientific expectations.