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THE OSIRIS-REX LASER ALTIMETER – AN OVERVIEW OF THE OLA TOPOGRAPHICAL MAPPING SYSTEM

Abstract

The OSIRIS-REx Laser Altimeter (OLA) instrument is an advanced scanning lidar that will provide topographical data on board the upcoming NASA New Frontiers OSIRIS REx asteroid sample return mission, set to launch in September 2016. The mission will provide the first pristine sample of a carbonaceous asteroid from (101955) Bennu. This asteroid has been classified as a Near Earth Object, and data from the OSIRIS-REx mission will ultimately improve predictions for estimating asteroid motion. Such predictions are essential, particularly for Bennu, owing to the fact that it is estimated to have a 1 in 2700 chance of impacting Earth in between 2175-2196.

Carbonaceous asteroids such as Bennu are thought to have been formed in the earliest period of our Solar System. The returned sample represents a time capsule that is not accessible through Earth- or spacecraft-based observations alone. Analysis of the returned sample will serve to increase our understanding of Solar System formation and evolution.

OLA's two transmitter assemblies allow for range data to be collected from 7 km down to less than 200 meters against the low albedo (4%) of the asteroid's surface. The laser is scanned across the surface at various mission phases, providing confirmation of navigational range to target; global topographical data down to 5-cm resolution; and high resolution 3D sample-site coverage with spot-to-spot spacing to less than 3 cm.

The OLA data will be used to determine the surface topography, such as crater size, shape and distribution, as well as the overall shape, and ultimately volume, of Bennu. These data will be used to determine the geology and dynamical history of Bennu. Data provided by OLA will also compliment that collected by the cameras and spectrometers, allowing for a comprehensive data set for sample-site selection.