IAF SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (Part 1) (4A)

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ASTEROID BENNU: THE MOST PRECISELY SURVEYED PLANETARY BODY IN OUR SOLAR SYSTEM, AS MEASURED BY THE OSIRIS-REX LASER ALTIMETER (OLA).

Abstract

The successful collection of a sample of asteroid (101955) Bennu in October of 2020 by the OSIRIS-REx spacecraft capped off nearly two years of characterization activities by a suite of cameras and a scanning lidar system known as the OSIRIS-REx Laser Altimeter (OLA). Owing to the unevenness of the asteroid's surface, upending predictions made during spacecraft development, the OLA instrument played an integral part in locating a site suitable for the sample collection maneuver.

Data from the OLA instrument were collected as a series of time-of-flight measurements, wherein each laser pulse measures the range to Bennu, and a 3D swath or raster of the surface is produced when the laser beam is steered across the surface. These measurements are co-registered and assembled into 3D surface representations. This data collection by OLA provided a 3D model of the entire asteroid surface at 2-meter resolution during the early portion of proximity operations, and later a higher-resolution model at 20 cm that was employed in sample site selection. Using the 3 billion laser range measurements that were obtained, models with resolution below 10 cm are in development – making Bennu the most precisely surveyed planetary body in the solar system (compared to measurements made on other planetary bodies using static lidars with resolutions in the 10s or 100s of meters).

Results from 3D modeling of Bennu will be summarized, highlighting global differences in shape such as a relatively smooth southern hemisphere versus a more irregular northern hemisphere.