

Latest Results from the Dawn at Ceres mission

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The Dawn spacecraft left Vesta orbit in September 2012 and set sail for Ceres, the most massive body in the main asteroid belt. Unlike Vesta, which is associated with both a prevalent class of meteorites the HEDs and an extensive family of asteroids (the vestoids), Ceres has neither associated meteorites or a family of asteroids. Thus while Dawn's exploration of these two protoplanets is nearly the same, the prime objectives of the two investigations are somewhat different. At Vesta, the prime objective was to test the link of Vesta to the Howardite-Eucrite-Diogenite meteorites, and the paradigms associated with that. In contrast, the Ceres investigation is pure discovery, as pre-Dawn low-resolution remote sensing data offer few clues. Discovered in 1801 by Giuseppe Piazzi, 1 Ceres is the largest, and one of the oldest and most intact objects in the asteroid belt, catalogued by the IAU as a dwarf planet in 2006. Ceres orbits the sun at an average distance of 2.77 and appears different from any other asteroid visited so far. Its surface is overall dark but displays a few bright areas, and two very bright spots. Cere's shape is consistent with thermal models predicting that Ceres has differentiated into a rocky core overlain by an ice mantle, which in the past hosted a substantial subsurface ocean, which could be present as a thin layer even today.

Dawn's exploration of these two objects is enabled by the efficient ion engines that emit xenon gas ionized by power from the 10kW solar array. The triple ion engines together deliver over 11 km/s of delta-V over the length of the mission. The spacecraft is equipped with a framing camera with one clear and seven color filters, a visible and infrared mapping spectrometer, VIR, a gamma ray and neutron detector, GRaND, and radiometric tracking for gravity determination. The payload delivers a powerful suite of instruments to perform the investigations.

Four different altitudes are used for mapping. The first science orbit (RC3) at ~13500 km altitude observes Ceres over multiple rotations, and includes high phase observations to search for plume activity. The Survey orbit at an altitude of 4424 km provides complete coverage with VIR and yields a coarse shape model and image mosaics for geologic mapping. The High Altitude Mapping Orbit (HAMO) collects multi-angle images for stereo photogrammetry at an altitude of 1474 km and image mosaics, including full color data. The final orbit (LAMO) at an altitude of 374 km collects GRaND elemental composition and gravity measurements. Dawn's observation program is scheduled to continue through June 2016.

First results of the Ceres mission will be presented along with highlights of the Vesta data and important lessons learned by this groundbreaking Discovery mission.