Geophysical Research Abstracts
Vol. 17, EGU2015-2444, 2015
EGU General Assembly 2015

Dawn Arrives At Ceres: First Obervations From Orbit

Christopher Russell (1), Carol Raymond (2), Andreas Nathues (3), Pablo Gutierrez-Marquez (3), Maria Cristina De Sanctis (4), Eleonora Ammannito (1), Thomas Prettyman (5), Alex Konopliv (2), Ryan Park (2), Harry McSween (6), Ralf Jaumann (7), Steven Joy (1), Carol Polanskey (2), and Marc Rayman (2)

(1) UCLA, Institute of Geophysics, Earth Planetary and Space Sciences, Los Angeles, United States (ctrussel@igpp.ucla.edu), (2) Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA-91109, (3) Max-Planck-Institut fur Sonnensystemforschung, Katlenburg-Lindau, Germany, (4) Istituto di Astrofisica e Planetologia Spaziali, Istituto Nazionale de Astrofisica, Rome, Italy, (5) Planetary Science Institute, Tucson, Arizona 85719, (6) Planetary Geoscience Institute and Department of Earth & Planetary Sciences, University of Tennessee, Knoxville, Tennessee 37996–1410, USA, (7) Institute of Planetary Research, German Aerospace Center (DLR), Berlin, Germany.

The Dawn spacecraft left Vesta orbit in September 2012 and set sail for Ceres, the second of its targets and the most massive body in the main asteroid belt. Unlike Vesta, associated with both a prevalent class of meteorites the HEDs, and an extensive family of asteroids, the vestoids, Ceres has neither associated meteorites nor a family of asteroids. Thus while the prime objectives of the Vesta investigation were paradigm testings, the prime objectives of the Ceres investigation are pure discovery with few clues from low resolution remote sensing. Discovered in 1801 by Guiseppe Piazzi, 1 Ceres is the largest, one of the oldest intact objects in the asteroid belt, classified by the IAU as a dwarf planet in 2006. Ceres orbits the sun at a distance of 2.77 and differs from any other asteroid visited so far. Its surface seems to be covered with clay, a hydrated rock alteration product, and might have regions covered with frost. This is consistent with thermal models making Ceres an icy object that has been subject to differentiation and hydrothermal activity, and that might host a liquid subsurface layer even today.
Dawn 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. It obtained its first resolved image of Ceres on December 1, 2014. This 9-pixel across image has been used to improve the stray light from the framing camera. This improved correction benefits not only Ceres imagery but also all color images obtained at Vesta.
On approach to Ceres and prior to the LPSC Dawn obtains images on seven occasions. Five of these are classified as optical navigation observations and two of them are classified as rotational characterizations in which a series of images are obtained as Ceres rotates. The first optical navigation images are similar to the resolution of the Hubble Space Telescope but the other images are up to 8 times higher resolution than Hubble. On approximately March 6, Dawn slips into orbit about Ceres and resolution progressively improves.
Four different altitudes are used for mapping. The first of these on Rotational Characterization 3 gives 20 x Hubble resolution. This orbit allows a search for plume activity and begins at the time of the EGU. The next orbit is called survey at an altitude of 4400 km and provides complete coverage for the VIR spectrometry, the next orbit is called HAMO standing for high altitude mapping orbit which provides the stereo photogrammetry at an altitude of 1500 km and the final orbit called LAMO for low altitude mapping orbit at an altitude of 400 km. This orbit is used for the GRaND elemental composition measurements and the gravity measurements. Dawn's observation program is scheduled to continue to June 2016.