

Photometry and surface mapping of asteroid (1) Ceres from HST observations

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The largest asteroid of the solar system, and one of the two targets of NASA's Dawn mission, (1) Ceres, has been observed by Hubble Space Telescope (HST) with the Advanced Camera for Survey (ACS), at three wavelengths, 535 nm, 335 nm, and 223 nm, at a pixel scale of about 30 km/pix. The disk-resolved photometric analysis has been carried out. The geometric albedos of Ceres at above three wavelengths are found to be 0.087 ± 0.003 , 0.056 ± 0.002 , and 0.039 ± 0.003 , respectively, assuming the same phase functions as in V-band. Combined with earlier HST observations and visible spectrum of Ceres, our observation shows a strong and broad absorption band centered at about 280 nm, with a FWHM of 120 nm. The albedo at the absorption band center is only about 30% of that outside the band. Hapke's modeling results in a photometric roughness parameter of $44 \pm 5^\circ$, consistent with previous estimates from both the IR observations and radar measurements, but is much higher than most asteroids and comets. The first global surface maps of Ceres have been constructed from these images and the photometric modeling, at all three wavelengths, covering $\pm 50^\circ$ latitude region. Eleven surface features have been identified according to their different albedo and colors from the surrounding areas, and can be correlated with geological and/or mineralogical features in the future. The albedo variations on the surface of Ceres is only 6%, and color variations of only 4%, indicating one of the most uniform surfaces of small bodies in the solar system.