P44B-05: The topography of Ceres and implications for the formation of linear surface structures

ABSTRACT

Thursday, 17 December 2015
17:00 - 17:15
Moscone West - 2005

NASA's Dawn spacecraft began orbiting the dwarf planet Ceres in April 2015. Framing Camera data from the Approach (1.3 km/px) and Survey (415 m/px) orbits include digital terrain models derived from processing stereo images. These models have supported various scientific studies of the surface. The eastern hemisphere of Ceres is topographically higher than the western hemisphere. Some of linear structures on Ceres (which include grooves, pit crater chains, fractures and troughs) appear to be radial to the large basins Urvara and Yalode, and most likely formed due to impact processes. However, set of regional linear structures (RLS) that do not have any obvious relationship to impact craters are found on the eastern hemisphere topographic high region. Many of the longer RLS are comprised of smaller structures that have linked together, suggestive of en echelon fractures. Polygonal craters, theorized to form when pervasive subsurface fracturing affects crater formation [1], are widespread on Ceres [2], and those proximal to the RLS have straight crater rims aligned with the grooves and troughs, suggesting that the RLS are fracture systems. A cross-section of one RLS is displayed in FC images of the Occator crater wall. Comparing these images to the digital terrain models show 1) that the structure dips ~60º and 2) there is downward motion on the hanging wall, implying normal faulting. The digital terrain models also reveal the presence of numerous positive relief features with sub-circular shapes. These dome-like features have been tentatively interpreted as volcanic/magmatic features [3]; other possibilities include salt domes. Analog models of domal uplift in areas of regional extension [4] predict patterns of linear structures similar to those observed in the RLS near Occator. Utilizing topography data provided by the Ceres digital terrain models, we assess the relationship between the RLS and nearby domes and topographic high regions to determine the mechanism by which the RLS may have formed.

[1] Thomas, P.C. et al. (1999) Icarus, doi: 10.1006/icar.1999.6121

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