EPSC Abstracts
Vol. 10, EPSC2015-219, 2015
European Planetary Science Congress 2015

Geomorphological related albedo features on Ceres

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1. Introduction

NASA's Dawn spacecraft entered orbit of Ceres on March 6, 2015, to spend one year characterizing the geology, elemental and mineralogical composition, topography, shape, and internal structure of the Ceres [1]. Ceres is supposed to be differentiated into a silicate core, a liquid water mantle and a solid ice crust with a surface temperature from 130K to 235K [2,3]. At the time of writing, the acquired image data from Ceres provide a spatial resolution of up to 2.1 km/pixel. The surface of Ceres reveals some albedo features that seem to be related to geomorphology. Those features show either a high or a low albedo compared to the surrounding.

2. Method

We measured the radiance factor of several pixels (different colored rectangles in figure 2, 3 and 5) over local time on the two bright spot features HST#1 and HST#5 and their surroundings.

3. Albedo features on Ceres

At ~11°E and 5.5°N a bright hill with a crater on the summit occurs (figure 1). The feature so far is named as HST#1 in the Hubble Space Telescope (HST) albedo map by [4] (figure 2).

Bright material also occurs as spots on crater walls and floors. The HST#5 feature at ~300°E and 20°N (figure 4) consists of both types and shows an average albedo with radiance factor of up to 0.12 over 15 km of area (figure 5).

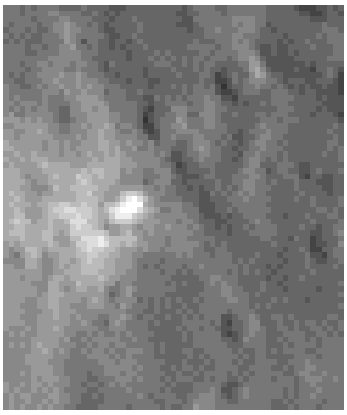

Figure 1: Bright material of HST#1.

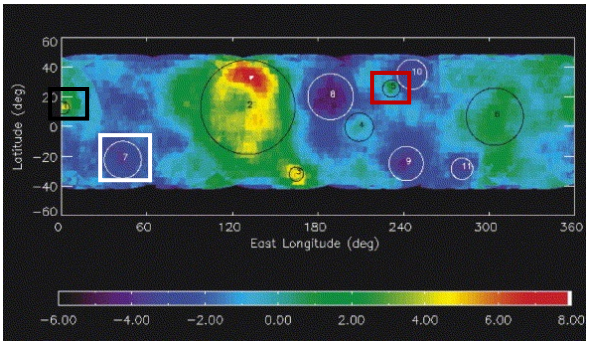

Figure 2: Albedo map from [4] showing the locations of HST#1 (black box) and HST#5 (red box) and HST#7 (white box) as identified by HST.

Bright material is distributed as radially rays around the crater. The surface radiance factor is up to 0.08 over 10 km of area(figure 3).

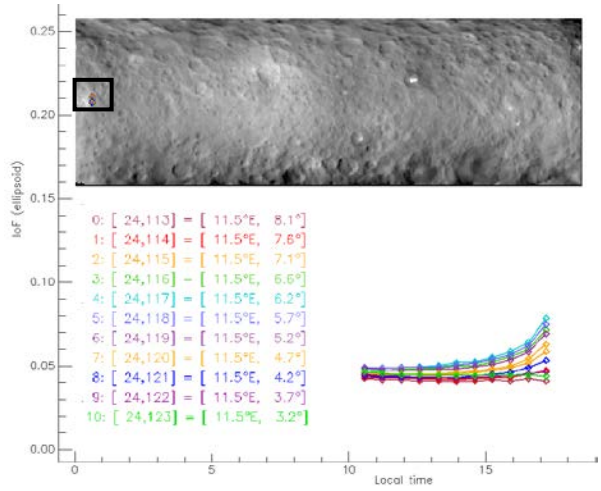

Figure 3: The figure shows the radiance factor of several pixels of HST#1 and its surroundings over the local time. The highest albedo of HST#1 (black box) is shown as light blue curve.

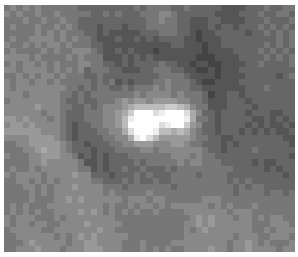

Figure 4: The two bright spots of HST#5.

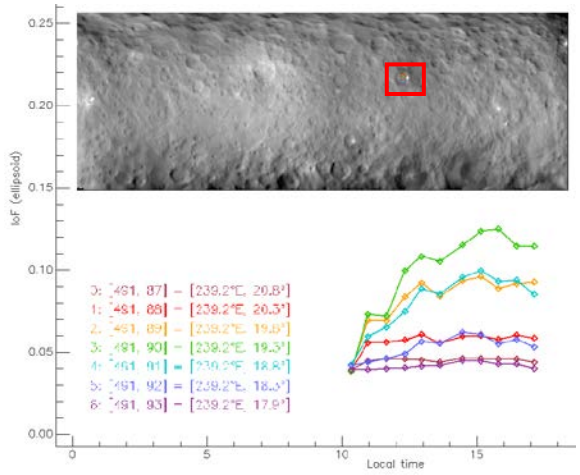

Figure 5: The figure shows the radiance factor of several pixels of HST#5 (red box) and its surroundings over the local time. The green curve shows the highest radiance factor.

Such features could be the result of exhalation of ice by cryovolcanism, or of ejected bright material, such as subsurface ice.

Ceres´ surface also reveals some darker regions. For example in the southern hemisphere between 30°E - 65°E and 25°S – 55°S darker plains, so-called HST#7 (figure 2, 6) are visible. The plains consist of smooth darker material possibly related to mass wasting.

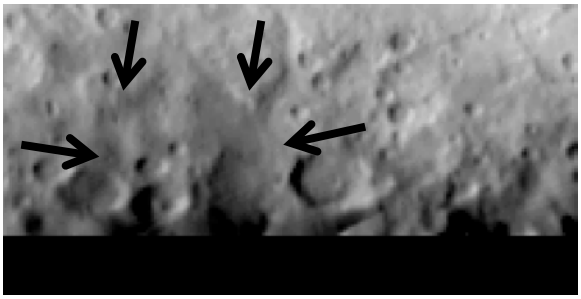

Figure 6: Darker plains of HST#7 (arrows).

In order to constrain whether the origin of the bright and dark material is endogenic or exogenic we will study the morphology and albedo parameters of these features in detail as soon as higher resolution data is available.

Acknowledgements

We thank the Dawn team for the development, cruise, orbital insertion, and operations of the Dawn spacecraft at Vesta. Dawn data are archived with the NASA Planetary Data System. K. Krohn is supported by the Helmholtz Association (HGF) through the research Helmholtz Postdoc Program.

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