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New Geologic Mapping of the Av-12 Sextilia Quadrangle of Asteroid 4 Vesta

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1. Introduction

NASA's *Dawn* spacecraft entered orbit of the inner main belt asteroid 4 Vesta on July 16, 2011, and is spending one year in orbit to characterize the geology, elemental and mineralogical composition, topography, shape, and internal structure of Vesta before departing to asteroid 1 Ceres in late 2012 [1]. As part of the *Dawn* data analysis the Science Team is conducting geological mapping of the surface, in the form of 15 quadrangle maps. This abstract reports results from the mapping of quadrangle Av-12, named Sextilia.

2. Data

The base for mapping this quadrangle is a monochrome Framing Camera (FC) mosaic produced from the High Altitude Mapping Orbit (HAMO) data with a spatial resolution of ~70 m/pixel. This base is supplemented by a Digital Terrain Model (DTM) derived from Survey orbit data. Also used to support the mapping are FC color ratio images from the Survey orbit with a spatial resolution of ~250 m/pixel, slope and contour maps derived from the DTM, and Visible and InfraRed (VIR) hyperspectral images from the Survey and HAMO orbits with spatial resolutions of 700 and 200 m/pixel, respectively.

3. Geologic Setting

Av-12 Sextilia Quadrangle is located between 21° - 66° South and 90° - 180° East. This quadrangle is dominated by the Sextilia crater. The crater is about 20 km in diameter and shows a very well preserved ejecta blanket around the rim. Quadrangle Av-12 is also dominated by two scarps, Argonium Rupes with 108 km in diameter (centered at 53.3°S and 166.7°E) and Matronalia Rupes which continues in Quadrangle Av-11 Pinaria with 180 km in diameter (centered at ~ 49°S and 85°E).
These two scarps define the rim of the Rheasilvia impact crater [2].

4. Geologic Units

Figure 1 shows the geological map of Av-12. Primary geologic features of this region include: (1) Rheasilvia material, including scarp wall material, slump deposits and ridge and groove terrain; (2) Dark material; (3) Slump material in impact craters; (4) Veneneia material [2].

4.1 Rheasilvia Material

The Rheasilvia impact basin extends across the Quadrangles 11-15 and encompasses different units. Av-12 contains (1) scarp wall material, (2) slump deposits, (3) and ridge and groove terrain. The scarps define the rim of Rheasilvia and have steep slopes [3]. Scarp wall material is characterized by a fresh morphology with low crater density and smooth material. The slump deposits have a low crater density and smooth material as well but compared to the scarp wall material the morphology is affected by ramps and a lower slope. The adjacent ridge and groove terrain shows ridges and grooves radiating about 90° to 270° [2].

4.2 Dark Material

The dark material appears in a variety of lower-albedo features on Vesta´s surface [4]. In the Sextilia quadrangle it is associated with impact craters and their ejecta as well as with linear features. In impact craters it normally occurs at the walls, which might be due to fallback ejecta or which indicates remnants of dark material strata [4]. Dark material which slumps down the wall is the result of mass wasting [4]. Widespread dark material occurs around craters containing dark material which is the result of impact ejecta processes. Linear dark features developed as a straight line through craters, like the Sextilia crater shows.

4.3 Slump material in impact craters

The Sextilia Quadrangle exhibits large differences in elevation that causes that some craters were formed on slopes. The material from the upslope rims overran the lower downslope rims and flowed out of the craters, like Helena shows [3].

4.4 Veneneia material

The northern part of the Quadrangle is dominated by an inhomogeneous higher cratered terrain with several large craters. The South Pole DTM indicates that the unit is a relic of a large basin, Veneneia underlying the Rheasilvia basin (Fig. 2) [2].

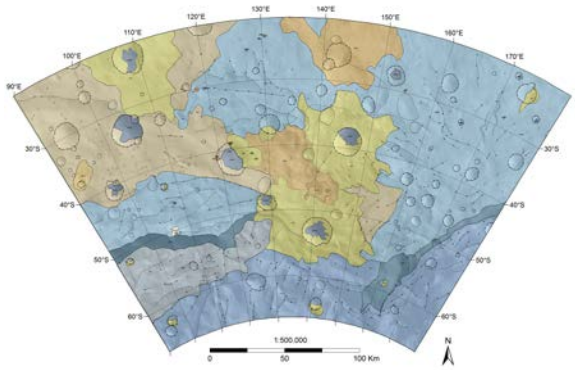

Figure 1: Geologic map of Quadrangle Av-12 Sextilia.

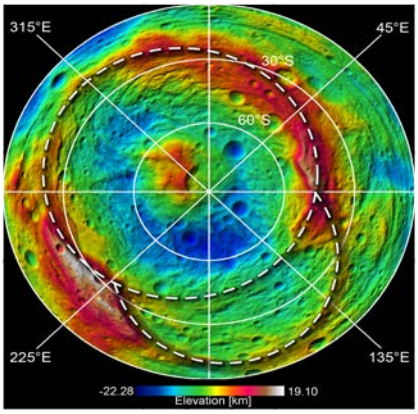

Figure 2: South Pole stereo DTM mosaic. Showing the rim of Rheasilvia and Veneneia.

References

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