GEOLOGIC MAPPING OF THE AV-6 (GEGANIA) QUADRANGLE OF ASTEROID 4 VESTA.

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Introduction: NASA's Dawn spacecraft arrived at the asteroid 4 Vesta on July 16, 2011, and is now collecting imaging, spectroscopic, and elemental abundance data during its one-year orbital mission. As part of the geological analysis of the surface, a series of 15 quadrangle maps are being produced based on Framing Camera images along with Visible & Infrared Spectrometer data obtained during the High-Altitude Mapping Orbit (HAMO) and Low Altitude Mapping Orbit (LAMO). This poster presentation concentrates on our geologic analysis and mapping of quadrangle Av-6 located between -22 and 22 degrees latitude and 144 and 216 degrees East longitude (Fig.1).

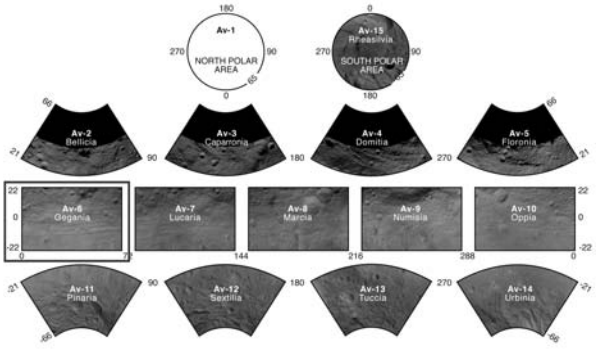

Fig.1. Location of the quadrangle Av-6 on Vesta.

Geologic setting: This quadrangle is dominated by degraded craters (subdued rims, less prominent bowl shape for smaller craters, no ejecta visible in clear or color bands) which we interpret to be older. However, there are several small (~10 km dia.) craters with higher-albedo ejecta blankets and/or rays; these we interpret to be relatively younger impact structures. Prevailing features observed are: A set of equatorial troughs up to ~20 km wide between ridge crests, parallel to the equator and spread between 14°S and 0°, a group of 3 subdued or "ghost" craters of similar diameters (~57 km), a relatively fresh ejecta mantling from Gegania crater and three smaller craters which exhibit a combination of bright and dark ejecta rays.

Main geologic units: By using the DEM from Survey orbit and image mosaics form HAMO and LAMO, we made a geologic map of the quadrangle and determined three main units.

1. The northern cratered trough unit in the upper part that is heavily-cratered and likely the oldest terrain.

2. The equatorial ridge and trough unit that is more widespread and is the highest terrain of the quadrangle. These giant E-W trending flat-floored troughs are separated by prominent ridges overlaid by craters mostly < 10 km in diameters (Fig. 2).

3. Part of a unit from the Rheasilvia formation is identified as well in the southern area of the map

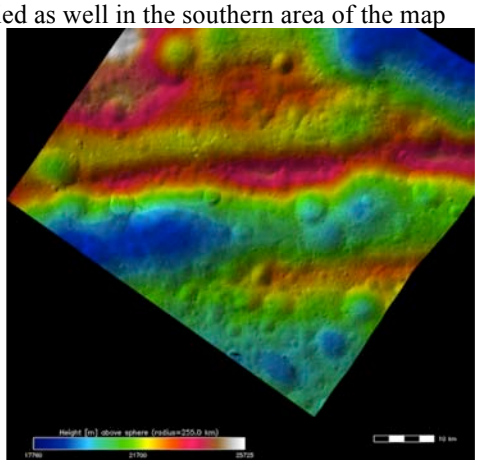

Fig.2. Close-up of some equatorial troughs and ridges using color coded elevation data on top of clear filter FC image.

Key geologic features: The quadrangle was named after Gegania, which is an apparent double crater (Fig.3). The crater on the right is older and has been altered by a subsequent impact. The associated ejecta can be distinguished as a smooth texture covering the surroundings.

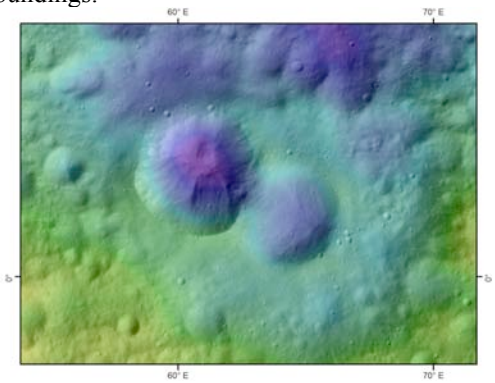

Fig.3. Color-coded topography and shaded-relief map of the Gegania crater.

Another interesting crater (Fig.4) exhibits bright ejecta with several patches of dark material found also within the ejecta. It is superposed on the set of giant equatorial grooves.

Fig.4. False color composite images of a bright and dark rayed crater (~10 km). *Left*: R=750 nm, G=920nm and B=980nm filters

Discussion: The 3 main units in this quadrangle have different textures, crater densities, topography, and are separated by scarps (e.g. white arrow in Fig.4). The transition to Rheasilvia is gradual whereas the transition to the northern cratered plain is more abrupt. These scarps may be ancient troughs or crater rims.

Fresh craters exhibit bright and dark material in the ejecta that is more easily seen in the FC color data. Bright material may be the result of excavation of eucritic lithology whereas dark material could be remnants of the impactor (CM2) or an excavated subsurface layer (endogenic or exogenic origin).

The set of giant equatorial troughs and ridges may be linked to the catastrophic impact event at the South pole (Rheasilvia formation).

In the 'Clementine' color ratio map, orange deposits with lobate morphology are widespread in the western part and found in other quadrangles as well. We will investigate whether these deposits are impact melt or volcanic flows using spectral information.

We will use FC mosaics with clear images and false color composites and DEM (Fig.5) as well as VIR spectroscopy data in order to constrain the geology, identify the nature of each unit present in this quadrangle and refine their boundaries.

Fig.5. Mosaics used to create the geologic map of this quadrangle. The first map is a clear filter image mosaic from Survey phase, the second map is a false color composite using Clementine color ratios of approach phase and the third map is a combination of elevation data and shaded relief derived from HAMO clear images. The last map is a slope map derived from the DEM that is helpful to identify scarps and ridges.