GEOLOGIC MAPPING OF THE AV-13 TUCCIA QUADRANGLE OF ASTEROID 4 VESTA. T. Kneissl[1], N. Schmedemann[1], G. Neukum[1], D.A. Williams[2], W.B. Garry[3], R.A. Yingst[3], E. Ammannito[4], R. Jaumann[5], C.M. Pieters[6], C.T. Russell[7], C.A. Raymond[8], P. Schenk[9], H. Hiesinger[10], T.B. McCord[11], D. Buczkowski[12], A. Nathues[13], V. Reddy[13], I. Büttner[13], K. Krohn[5], F. Preusker[5], [1]Freie Universitaet Berlin, Berlin, Germany, (Thomas.Kneissl@fu-berlin.de); [2]ASU, Tempe, AZ, US; [3]PSI, Tucson, AZ, US; [4]IFSI/INAF, Rome, Italy; [5]DLR, Berlin, Germany; [6]Brown University, Providence, RI, US; [7]Institute of Geophysics, University of California, Providence, CA, US; [8]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, US; [9]LPI, Houston, TX, US; [10]Institut für Planetologie, Westfälische Wilhelms-Universität, Münster, Germany; [11]Bear Fight Center, Winthrope, WA, US; [12]JHU-APL, Laurel, MD, US; [13]Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany.

Introduction: NASA's *Dawn* spacecraft entered orbit of the inner main belt asteroid 4 Vesta on July 15, 2011, and is spending one year in orbit to characterize the geology, chemical and mineralogical composition, topography, shape, and internal structure of Vesta before departing to asteroid 1 Ceres in late 2012. 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-13, named Tuccia.

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 stereo image data with a lateral spacing of 450 m/pixel (10 pixels per degree) and a vertical accuracy of ~30 meters. Also used to support the mapping are FC color ratio images from the Survey orbit with a spatial resolution of ~250 m/pixel, slope 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.

Geologic Setting: The Av-13 Quadrangle covers the region between 21°-66°S latitude and 180°-270°E longitude. It represents the transition zone between the equatorial high-relief terrains and the floor of Rheasilvia. The Rheasilvia impact structure, whose center is located close to the south pole of Vesta (at ~70°S, ~300°E [1]), is approximately 500 km in diameter and superposes an older impact structure with a diameter of ~400 km and center at ~50°S and ~165°E [1]. Parts of the floors of both impact structures are located within the Tuccia quadrangle.

The Tuccia impact crater which names quadrangle Av-13 is located at 40°S and 197°E and has a diameter of about 16 km. The fresh bright-rayed crater on its rim has a diameter of ~3.4 km. The largest impact crater in the quadrangle located approx. 30 km east of the Tuccia crater has a diameter of ~25 km and shows lobate material on the eastern wall and the floor.

Geologic Units & Features: The Tuccia quadrangle is dominated by three different terrains: a) *Vestalia Terra (Equatorial High-Relief Terrain)* which is located in the north of the quadrangle and reaches elevations up to 19 km (above ellipsoid), b) the *Equatorial Cratered Terrain* which contains the floor of a ~400km-diameter impact structure superimposed by the Rheasilvia structure, and c) the *Ridge-and-Groove Terrain* which is part of the Rheasilvia Formation. Mass wasting seems to have been the dominant process modifying the *Ridge-and-Groove Terrain* in the south of the quadrangle (Rheasilvia floor) resulting in a complex system of scarps, ridges, and grooves.

The crater *Vibidia* is located at 27.9°S and 220.3°E and has a diameter of ~7.5 km. It is a fresh-looking bright-rayed crater, which, however, also excavated dark material visible on the crater floor and at the eastern crater rim. Outcrops of dark material are also located at the eastern crater wall of a 25km-diameter crater at 30.0°S and 228.0°E. Interestingly, both occurrences of dark material are on the boundary/scarp of *Vestalia Terra*, which may indicate that dark material is existent in the subsurface of the equatorial high-relief terrain.

Another interesting crater is located at 60°S and 200°E on a steep slope on the Rheasilvia ridge-and-groove terrain. This crater has a diameter of approximately 15 km and shows a sharp, undegraded crater rim in the north and a highly degraded/covered crater rim in the south. Proposed formation proesses for this irregular crater rim are: ballistic ejecta coverage of the southern rim, incomplete formation of the rim, as well as mass-wasting processes like slumping and landslides [2]. A definitive interpretation of this and other features in the Tuccia quadrangle requires the analysis of the higher spatial resolution FC and VIR data from the Low Altitude Mapping Orbit (LAMO), which is currently being acquired.

Compositional Information: Compositional differences in the Tuccia quadrangle have been analyzed

using FC color-ratio images and VIR data. The FC color-ratio mosaic shown in Fig.2 uses the Clementine ratios (R750/430; G750/920; B430/750 nm) and shows color differences at the two bright-rayed craters (Vibidia crater and the crater on the rim of Tuccia), at several small-scale occurrences of dark material, and the surroundings of the 15 km-diameter crater at 60°S and 200°E showing the irregular crater rim.

The analysis of VIR data has concentrated on the depths of the 1 μm and 2 μm absorption bands providing information on the quantity of pyroxene minerals. However, band depths are also indicators of material physical properties like grain sizes. First investigations showed that compositional differences detected in VIR data (as far as available) correlate with color differences detected in FC color data.

References: [1] Buczkowski, D. et al., (2011) AGU, abstract #U21B-05. [2] Jaumann, R. et al. (2012) *Science*, in review.

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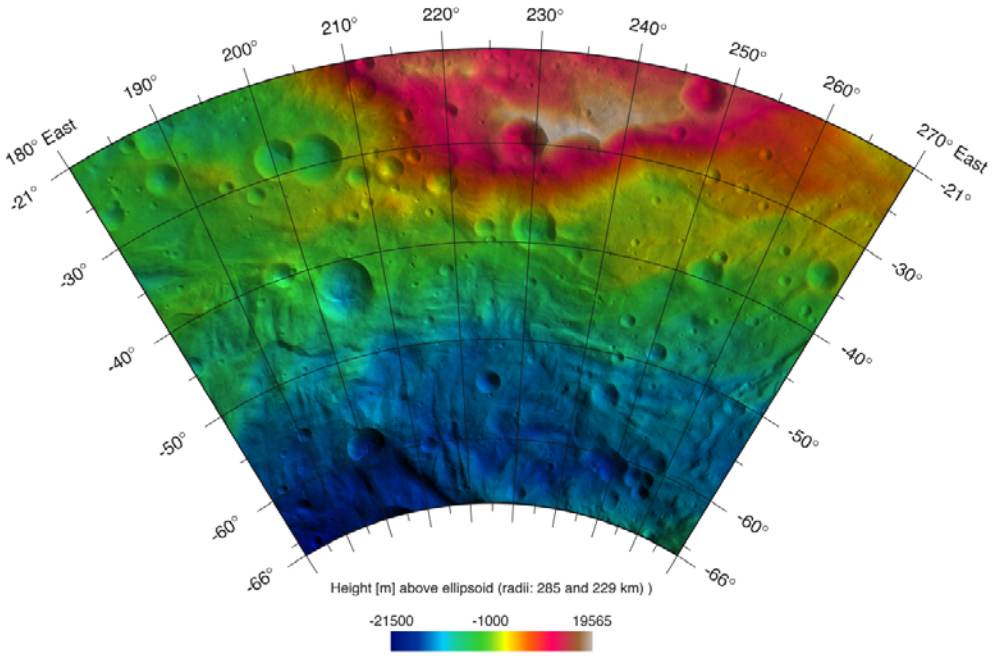

Figure 1. Color-coded Digital Terrain Model of quad Av-13, derived from NASA Dawn FC monochrome imaging.

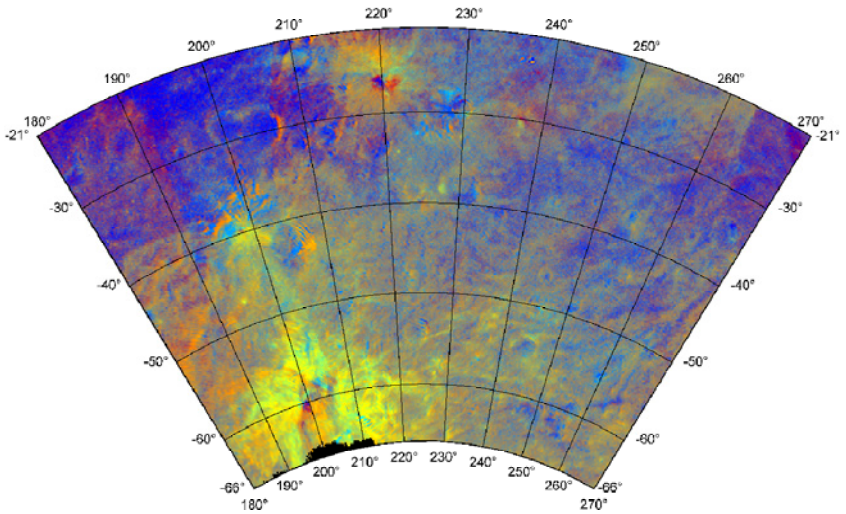

Figure 2. FC color ratio mosaic of quad Av-13. This figure uses the *Clementine* color ratios (Red: 750/430 nm, Green: 750/920 nm, Blue: 430/750 nm).