GEOLOGIC MAPPING OF THE AV-4 DOMITIA QUADRANGLE OF ASTEROID 4 VESTA. J.E.C. Scully[1], C.T. Russell[1], A. Yin[1], D.A. Williams[2], D.T. Blewett[3], D.L. Buczkowski[3], E. Ammannito[4], T. Roatsch[5], F. Preusker[5], L. Le Corre[6], R.A. Yingst[7], W.B. Garry[7], R. Jaumann[5], C.M. Pieters[8], C.A. Raymond[9], [1]Department of Earth and Space Sciences, University of California, Los Angeles, California 90095-1567, USA (jscully@ucla.edu), [2]Arizona State University, Tempe, AZ, USA, [3]JHU-APL, Laurel, MD, USA, [4]INAF/IFSI, Rome, Italy, [5]DLR, Berlin, Germany, [6]Max Planck Institute, Katlenburg-Lindau, Germany, [7]PSI, Tucson, AZ, USA, [8]Brown University, Providence, RI, USA, [9]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA.

Introduction: NASA's Dawn spacecraft entered orbit of the inner main belt asteroid 4 Vesta on July 16th, 2011, and its one year survey allows characterization of the geology, elemental 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-4, named Domitia after the Roman vestal virgin.

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 Digital Terrain Models (DTMs) derived from HAMO and Survey orbit data. Also used to support the mapping are slope and contour maps derived from the DTMs; Visible and InfraRed (VIR) hyperspectral spectrometer images from the Survey and HAMO orbits (with spatial resolutions of ~700 m/ pixel and ~200 m/pixel respectively) and FC color ratio images from the Survey orbit (with a spatial resolution of ~250 m/pixel). Initial data interpretations of the Low Altitude Mapping Data (LAMO) from the FC (with a resolution of ~20 m/pixel), VIR (with a resolution of ~100 m/pixel), and compositional data from the Gamma Ray and Neutron Detector (GRaND) are also included.

Geologic Setting: Av-4 Domitia quadrangle is situated from 21-66°N and 180-270°E in Vesta's northern hemisphere. Due to its location in the northern hemisphere the upper portion of this quadrangle has yet to be illuminated by the Sun and studied [1]. The northern tip of Vesta's high relief terrain, called Vestalia Terra, extends into the southern portion of Domitia quadrangle. Vesta's crater density is highest in the northern hemisphere and relative crater age dating shows that Vesta's northern regions are older than the southern regions [2]. Thus, the heavily cratered landscape of Domitia quadrangle is typical of Vesta's northern hemisphere. Morphologically, craters in Domitia quadrangle are classified into four types, each with different abundances: a. fresh scarp rimmed craters: ~7%; b. partly degraded subdued rimmed craters: ~37%; c. heavily degraded subdued rimmed craters: ~37%; d. ruin eroded craters: ~19%.

Geologic Units & Key Features: Domitia quadrangle is located in Vesta's Northern Cratered Trough Terrain, which is a heavily cratered area with many large-scale troughs and small-scale grooves. This terrain is one of the Vesta's three global terrains [3]. The key geologic features of Domitia quadrangle are discussed below:

Domitia crater. Domitia crater is a ~45 km diameter, partly degraded subdued rimmed crater located at ~38°N, 188°E. It is superposed by many younger, smaller craters. Due to the current illumination restrictions its southern interior has not yet been illuminated/ imaged. Domitia quadrangle is named after Domitia crater because it is a large and distinctive feature, which is completely contained in this quadrangle.

Saturnalia Fossa and associated structures. This is the dominant trough within a NW-SE trending trough system, which is located in Domitia quadrangle and in the other northern quadrangles. Saturnalia Fossa is ~25 km wide on average, with a center latitude and longitude located at ~32°N, 257°E. There are a number of other troughs oriented sub-parallel to Saturnalia Fossa. This system of troughs, and the ridges between them, appear to influence the smaller scale structures in Domitia quadrangle: grooves, pit crater chains and lineaments are mostly roughly sub-perpendicular to the trough and ridge system and the remaining grooves, pit crater chains and lineaments are sub-parallel to the trough and ridge system. All of these structures may be part of, and evidence for, extension in Domitia quadrangle. The formation mechanism of these features is still under investigation, using the recently acquired high resolution LAMO data. The poles to Saturnalia Fossa and the other troughs were found to cluster at ~60±10°S, 165°E, which is near the center of the older of Vesta's two southern basins [4]. This indicates a likely connection between the formation of this basin and Saturnalia Fossa and its associated features.

Other structures. Curvilinear grooves in the southern part of Domitia quadrangle were possibly formed by left lateral movement. Possible thrusts and contrac-

tional structures are distributed throughout Domitia quadrangle. LAMO data will help to determine whether they are formed by a tectonic or regolithic or another process.

Dark material. Dark material is distributed across Vesta's surface [5]. In Domitia quadrangle it occurs as lobate features and as material cropping out of and slumping into the interior of a crater. The lobate dark material is distributed throughout Domitia quadrangle and covers a reasonably large area. In contrast, material crops out of only one crater and the dark material in this crater covers a small area. The composition and origin of Vesta's dark material is currently being studied.

Composition: Up until now the compositional analysis of Domitia quadrangle has mostly focused on the band depth of the 1μm and 2μm absorptions of pyroxene. The average values of the 1μm and 2μm band centers suggest a mixed howarditic-eucritic-like composition for this quadrangle. The average inferred mineralogy of Vesta is howarditic [6]. The quantity of pyroxene minerals and physical properties, such as grain size, are reasonably constant throughout Domitia quadrangle. However there is some variability, which is under investigation.

References: [1] Russell C. T. et al. (2011) Fall AGU, U21B-01. [2] Marchi S. et al. (2012) 43rd LPSC, this volume. [3] Yingst R. A. et al. (2011) Fall AGU, P43B-0248. [4] Buczkowski, D. et al. (2011) Fall AGU, U21B-05. [5] Jaumann R. et al. (2011) Fall AGU, U21B-02. [6] De Sanctis M. C. et al. (2012) 43rd LPSC, this volume.

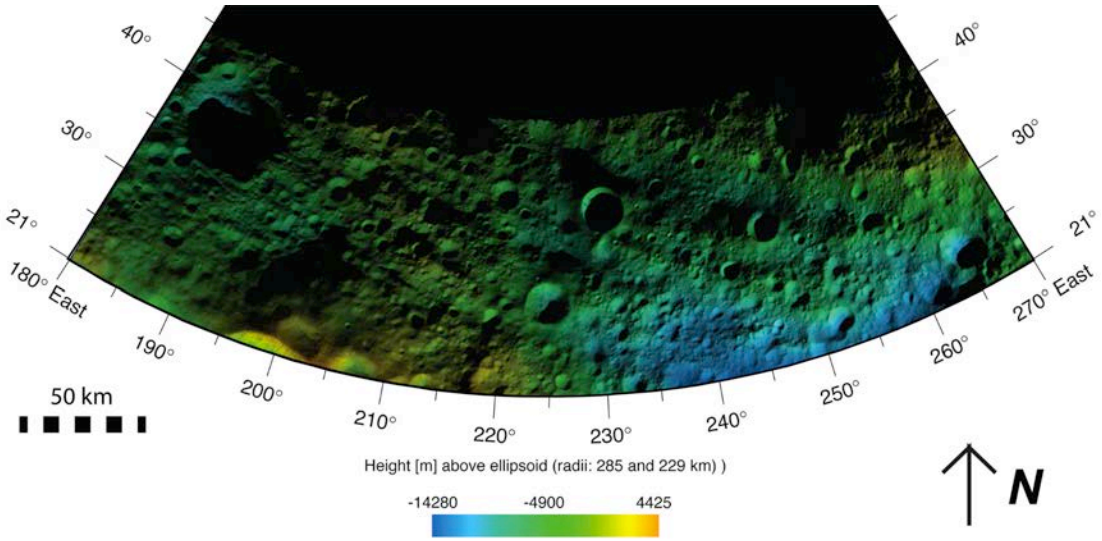

Figure 1: Color-coded height image of Domitia quadrangle. This is from the DTM derived from the Survey orbit stereo image data and has a lateral spacing of 450 m/pixel (10 pixels per degree), a vertical accuracy of ~30 meters and a lambert conformal projection. Image Credit: DLR

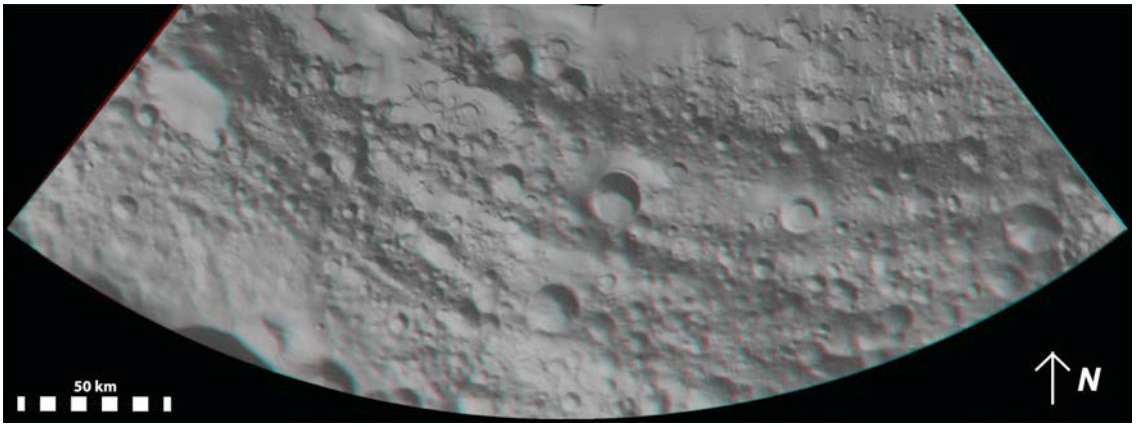

Figure 2: Anaglyph image of Domitia quadrangle with a spatial resolution of ~150 m/pixel. Image Credit: D. O'Brien