GEOLOGIC MAPPING OF THE AV-11 PINARIA QUADRANGLE OF ASTEROID 4 VESTA. [1]T. Ho enboom, [1]P. Schenk, [1]O.L. White, [5]D. Williams, [8]H. Hiesinger, [5]W.B. Garry, [5]R.A. Yingst, [6]D. Buczkowski, [7]T.B. McCord, [3,4]R. Jaumann, [9]C.M. Pieters, [2]R.W. Gaskell, [4]G. Neukum, [4]N. Schmedemann, [12]S. Marchi, [11]A. Nathues, [11]L. Le Corre, [3]T. Roatsch, [5]F. Preusker, [10]C. DeSanctis, [10]G. Filacchione, [13]C.A. Raymond, [14]C.T. Russell and the Dawn team, [1]Lunar and Planetary Institute, Houston, Texas, USA (Hoogenboom@lpi.usra.edu); [2]Planetary Science Institute, Tucson, AZ, USA; [3]Institute of Planetary Research, Berlin, Germany; [4]Freie Universitaet, Berlin Germany; [5]Arizona State University, Tempe, AZ, USA; [6]Applied Physics Laboratory, Johns Hopkins University, Laurel, MD, USA; [7]Bear Fight Institute, Winthrop, WA, USA; [8]Wilhelm Westfalich University, Munster, Germany; [9]Brown University, Providence RI, USA; [10]Instituto Nazionale di Astrofisica, Rome Italy; [11]MPI for Solar System Research, Katlenburg-Lindau, Germany; [12]Observatoire de la Cote d'Azure, Nice France; [13]Jet Propulsion Laboratory, Pasadena CA USA; [14]Institute of Geophysics, UCLA Los Angeles CA, USA.

Introduction: NASA's *Dawn* spacecraft entered orbit of the inner main belt asteroid "4Vesta" in July 2011, and is spending one year in orbit to characterize its geology, elemental and mineralogical composition, topography, shape, and internal structure before departing to asteroid "1Ceres" in late 2012. As part of the *Dawn* data analysis the Science Team is conducting geologic mapping of the surface, in the form of 15 quadrangle maps. This abstract describes the results from mapping quadrangle Av-11 (Pinaria).

Data and Mapping Procedure: 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 (Figure 1). Also used to support the mapping and refine unit boundaries 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.

Geologic Setting: Av-11 straddles the 45-degree longitude in the South Polar Region. It is dominated by the rim of the ~505 km south polar topographic feature, Rheasilvia. Av-11 also contains ~5 craters > 25 km in diameter including Pinaria. Sub-parallel ridges and grooves dominate and are broadly parallel to the rim scarps and ejecta deposits.

Geologic Units & Features: Av-11 contains a rich variety of geologic terrains associated with the Rheasilvia basin and post-basin impacts. The map of Av-11 is shown in Figure 2. This quadrangle is dominated by the outer portion of the large 505 km diameter south polar topographic feature (Rheasilvia) first observed by HST [1] and described in detail by [2]. Sparsely cratered (relatively), the portion of Rheasilvia covered in Av-11 is dominated by a 20 km high rim scarp (Matrolnalia Rupes) and by arcuate ridges and troughs forming a radial to spiral pattern across the floor.

Primary geologic features of Av-11 include: (1) Ridge-and-Groove terrain (2) Impact cratering (3) Smooth lobate materials and (4) Slump materials:

(1)Ridge-and-Groove Terrain. In Av-11, the Rheasilvia formation encompasses trends of ridges and grooves, and patches of smoother, less-cratered terrain. The ridge-and-groove terrain consists of ridges and grooves radiating approximately 90°-270°, and ridges and troughs or ridge and groove complexes radiating arcuately from the central mound unit. Ridge-and-Groove terrain is interpreted to be structural disruption of the basin floor associated with basin formation. Arcuate ridges and troughs, and the transition to smooth areas to the north confirm that Rheasilvia has an impact origin.

(2)Impact craters. Most terrain in the quadrangle is heavily cratered. The largest crater in Av-11 is Pinaria crater, which is 37 km in diameter and located at -29S and 32E. Mass wasting deposits are observed on its floor. Other craters range from those with fresh, sharp rims, craters with degraded rims and craters that are little more than depressions. Secondary crater chains and fields are also evident in Av-11 as are craters with rims of heterogeneous degradation (a portion is sharp and fresh-appearing, while a portion is subdued and apparently mantled with material of albedo similar to the surroundings). Higher-resolution VIR data will be important in determining the nature of the potential mantling material.

(3)Slump material. Mass wasting observed along Rheasilvia rim scarp and in the largest craters indicates scarp failure is a significant process (Figure 3). Parallel fault scarps mark this deposit of slumped debris at the base of 20 km high Matronalia Rupes, which may have formed during or shortly after the basin. Along the base of the bounding scarp, patches of material characterized by a low crater density and smoother, somewhat granular-textured morphology are observed. Irregularly bounded patches of very smooth material 25-35 km across are often located on slopes or topographically lower regions. We interpret most of these deposits as slump material emplaced as a result of the

effects of basin formation and settling. However, some deposits may be post-impact (e.g. driven by uplift or relaxation). Highest-resolution data from the Low-Altitude Mapping Orbit (LAMO) may better reveal the nature and relative stratigraphy of these deposits.

(4)Smooth Lobate Materials. Lineations and lobate scarps are observed on the Rheasilvia ejecta deposit (Figure 4) outside Rheasilvia rim in the NE section of Av-11 (the smoothest terrain on Vesta), and are consistent with formation by ejecta. Partial burial of older craters by ejecta near 25S 40-60W deposits are observed.

References: [1] Thomas et al., (1997*) Science Vol. 277 no.5331* pp.1492-1495 [2]Schenk et al., (2011), *AGU Abstract U21-B03*.

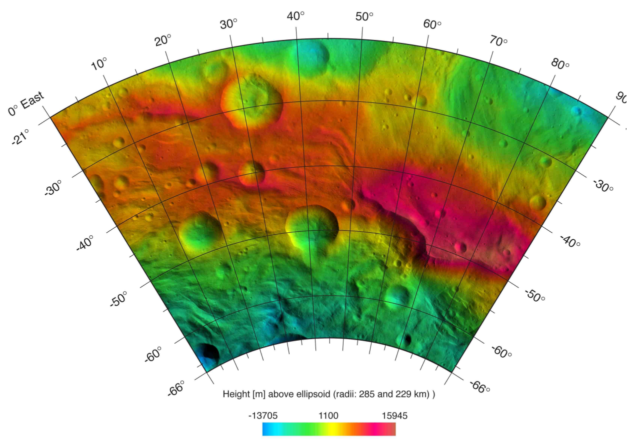

Figure 1. Color-coded Digital Terrain Model of quad Av-11, derived from NASA Dawn FC monochrome imaging.

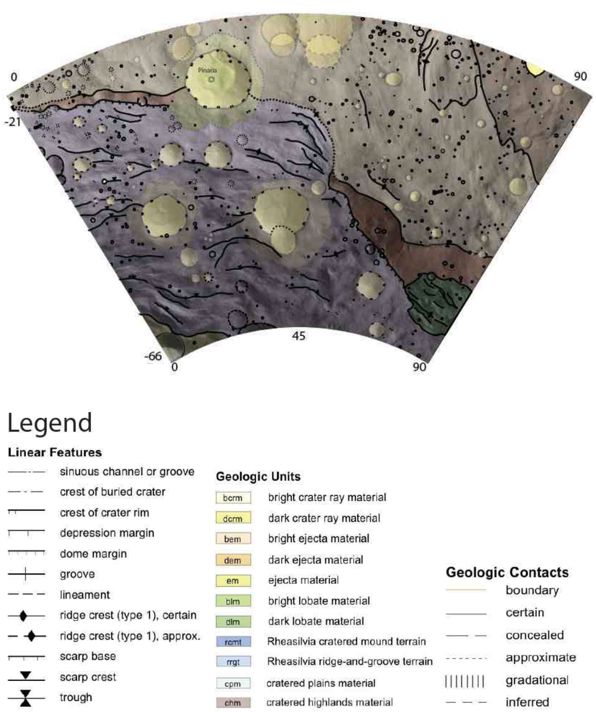

Figure 2. Geologic map of Av-11 Pinaria Quadrangle, Vesta.

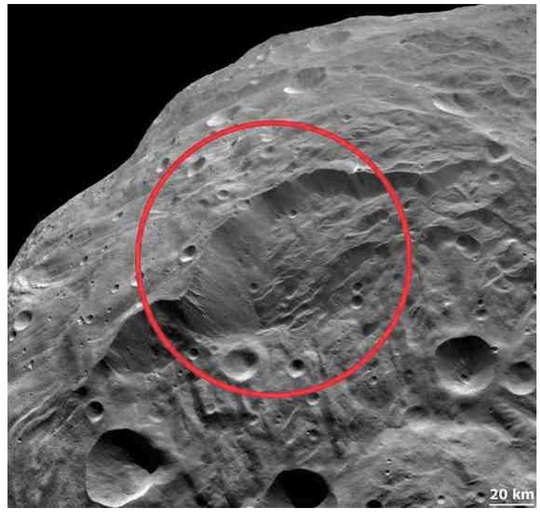

Figure 3. Mass-wasting of rim scarp showing parallel fault scarps.

Figure 4. Lineations and lobate scarps on Rheasilvia Ejecta Deposit.