THE RHEASILVIA IMPACT BASIN ON VESTA. D. P. O'Brien[1], D. L. Buczkowski[2], E. Ammannito[3], R. Jaumann[4], L. Le Corre[5], S. Marchi[6], H. Y. McSween[7], C. A. Raymond[8], P. Schenk[9], M. C. De Sanctis[3], R. Gaskell[1], M. Hoffmann[5], A. Nathues[5], F. Preusker[4], C. T. Russell[10] and the Dawn Science Team, [1]Planetary Science Institute, 1700 E. Ft. Lowell, Suite 106, Tucson, AZ 85719 (obrien@psi.edu), [2]Johns Hopkins University Applied Physics Lab, Laurel, MD, [3]Istituto Nazionale di Astrofisica, Rome, [4]DLR, Institute of Planetary Research, Berlin, [5]Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, [6]NASA Lunar Science Institute, Southwest Research Institute, Boulder, CO, [7]University of Tennessee, Knoxville, TN, [8]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, [9]Lunar and Planetary Institute, Houston, TX, [10]Institute of Geophysics and Planetary Physics, University of California, Los Angeles, CA.

Introduction: The Dawn mission has completed its Survey and High-Altitude Mapping Orbit (HAMO) phases at Vesta, and is currently taking data in its Low-Altitude Mapping Orbit (LAMO) with Framing Camera (FC) resolution as high as ~20 m/px [1]. From this imaging data, global topography models have been derived [2]. In addition, the VIR (Visual and Infrared) instrument is acquiring hyperspectral images of Vesta surface from UV to IR (0.25 to 5 micron), with a resolution up to few tens of m/px [3], and GRAND (Gamma Ray and Neutron Detector) is currently collecting data to obtain constraints on the bulk composition of the surface.

These data have provided unprecedented views of the south polar impact structure first detected in HST imaging [4], now named Rheasilvia, hint at the existence of a population of ancient basins, and provide clues to the compositional diversity of Vesta's surface and the role that large impacts have played in excavating materials from deeper in its crust.

Rheasilvia: Rheasilvia is a broad depression approximately 500 km in diameter, with a pronounced central peak roughly 100 km across that rises 20-25 km above the basin floor [5, Fig. 1]. The basin floor is deformed by a dense network of linear and curvilinear scarps and ridges, which form radial to spiral patterns that often intersect one another. The outer margin of the Rheasilvia basin is not regular, but ranges from a low ridge in some areas to a prominent scarp over 15 km high in other areas. Possible landslide features extend to the basin floor from both the margin and the central peak. Crater counts within Rheasilvia are significantly lower than most other areas of Vesta's surface, indicating a relatively young age [6].

The area surrounding Rheasilvia varies in appearance, from heavily cratered areas that may have received little or no ejecta blanketing, to relatively smooth areas with possible flow features that may represent ejecta from the crater. A set of troughs circling the equatorial region is concentric with Rheasilvia and likely related to its formation [7].

VIR spectra and FC color photometric data both indicate an asymmetric distribution of diogenite-rich

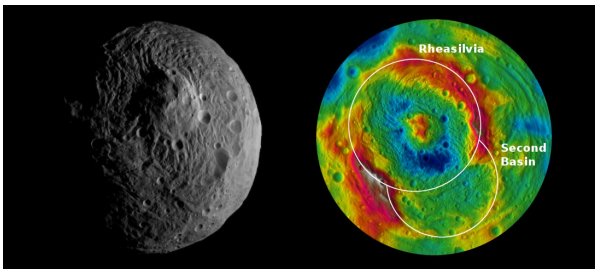

Figure 1: *Dawn approach image (left) and topography of the south polar region from -90° to the equator (right).*

material within and surrounding Rheasilvia [8,9]. Pure olivine has not yet been detected within Rheasilvia, although such detection is likely difficult [10]. GRAND results are still preliminary.

A Second South Polar Basin: Numerous depressions can be identified in the topography data that may be the remains of other large impact basins [6]. The largest of these basins is approximately 400 km in diameter and is partially overlain by Rheasilvia, indicating an older age [Fig. 1]. It does not appear to have a central peak, although the region where the central peak would occur corresponds to the rim of Rheasilvia, and thus it may have been destroyed or obscured. A set of troughs in the northern hemisphere is concentric with this basin [7]. Unlike Rheasilvia, it does not have a significant diogenite spectral signature.

In addition to surface modification, the formation of basins can eject rocks to become members of the Vesta family, and finally HED meteorites. Furthermore, basin-forming impacts can potentially reset the Ar-Ar ages of rocks on the surface of Vesta, and are thus important for understanding the ages recorded in the HED meteorites [11,12].

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