GEOLOGIC MAPPING OF THE AC-H-13 URVARA QUADRANGLE OF CERES FROM NASA'S DAWN MISSION. H. G. Sizemore[1], D. A. Williams[2], T. Platz[1,3], S. C. Mest[1], R. A. Yingst[1], D. A. Crown[1], D. O'Brien[1], D. L. Buczkowski[4], P. M. Schenk[5], J. E. C. Scully[6], R. Jaumann[7], T. Roatsch[7], F. Preusker[7], A. Nathues[3], M. C. De-Sanctis[8], C. T. Russell[9], C. A. Raymond[6], [1]Planetary Science Institute, Tucson, Arizona (sizemore@psi.edu), [2]Arizona State University, Tempe, AZ USA,[3]MPI for Solar System Research, Göttingen, Germany, [4]JHU-APL, Laurel, Maryland, USA, [5]LPI, Houston, Texas, USA, [6]NASA JPL, California Institute of Technology, Pasadena, California, USA, [7]DLR, Berlin, Germany, [8]National Institute of Astrophysics, Rome, Italy, [9]UCLA, Los Angeles, California, USA.

Introduction: NASA's Dawn spacecraft arrived at Ceres on March 5, 2015, and has been studying the dwarf planet through a series of successively lower orbits, obtaining morphological, topographical, mineralogical, elemental, and gravity data. The Dawn Science Team is conducting a geologic mapping campaign for Ceres similar to that done for Vesta [1,2], including production of a Survey- and High Altitude Mapping Orbit (HAMO)-based global map, and a series of 15 Low Altitude Mapping Orbit (LAMO)-based quadrangle maps. In this abstract we discuss the geologic evolution of the Ac-H-13 Urvara Quadrangle.

Mapping Data: At the time of this writing LAMO images (35 m/pixel) are just becoming available. Thus, our geologic maps are based on HAMO images (140 m/pixel) and Survey (400 m/pixel) digital terrain models (for topographic information). Dawn Framing Camera (FC) color images are also used to provide context for map unit identification. The maps to be presented as posters will be updated from analyses of LAMO images.

Mapping Results: The Urvara Quadrangle is dominated by the 170-km diameter impact basin Urvara (46.4°S, 248.6°E) and includes cratered terrain to the west. Named features include the impact craters Meanderi (40.9°S, 193.7°E, 103 km diameter), Sekhet (66.4°S, 254.9°E, 41 km diameter), and Fluusa (31.5°S, 277.9°E), as well as the crater chains Gerber Catena (38.1°S, 214.8°E) and Samhain Catena (19.6°S, 210.3°E). Preliminary geologic mapping defined three major units (*cratered terrain, smooth material,* and *undivided cratered material*) that dominate the quadrangle. Additional mapped units include *hummocky material*, *lobate material*, *crater central peak material*, *crater terrace material*, *crater rim material*, and *pitted terrain* (Fig. 1) [3,4]. Mapped features include crater rims, crater central peaks, crater chains, ridges, troughs, domes, grooves, and lineaments.

Impact structures in the Urvara Quadrangle range from degraded features in the north whose rims are only apparent in topography data, to realtively pristine features (including Urvara itself) with distinct rims and ejecta deposits that are apparent in both color and greyscale imagery. Four craters, again including Urvara, exhibit strong asymmetries in the texture and/or extent of ejecta materials. Two unnamed craters in the southwest portion of the quadrant have complete rims, but strongly asymmetric ejecta. A third unnamed crater in the northeast portion of the quadrangle is also asymmetric; the western rim of this crater has collapsed and mapped ejecta extend to the west. All three small asymmetric craters are associated with hummocky and lobate materials. These observations suggest that there may be substantial heterogeneity in the material properties and volatile content of the subsurface.

Like the smaller impact craters, the Urvara basin exhibits a distinct morphological and textural dichotomy. The northern rim is sharply defined. The southern rim is less distinct, due to the presence of rugged interior wall terraces and hummocky ejecta to the south. A portion of the Urvara rim bounding the Yalode basin to the east is heavily degraded. Smooth material covers much of the Urvara floor, as well as the northern interior wall, and an extended region to the north of the basin. The distribution of this material suggests that much of it was deposited as fluidized ejecta, and via wall collapse. Additionally, some smooth basin floor materials maybe sourced from a system of grooves or lineaments on the Urvara floor via post-impact extrusion of volatile rich material. Embayment relationships with the surrounding terraced wall material, and possible flow margins (mapped as undefined linear features) are consistent with this interpretation. Pitted textures near the base of the central peak complex and at the eastern margin of the groove system may indicate volatile loss, again consistent with impact emplacement or possible extrusion of a volatile rich material. Smooth floor materials and associated linear features will be mapped in detail as LAMO images of the region become available.

Both Samhain Catena and Gerber Catena run west by northwest across the western portion of the quadrangle. Because these features run parallel to four similar catenae in the Occator quadrangle to the north, and because individual craters in Samhain divert around a degraded crater, they likely did not originate via secondary impacts. We interpret them to be pit crater chains. In contrast, a pair of large curvilinear depressions extending eastward from Urvara toward Yalode mirror the curvature of three secondary crater chains to the south in the Zadeni Quadrangle. Both curvilinear depressions in the Urvara Quadrangle narrow and separate into crater chains at their distal ends, suggesting that they originated as secondary impact chains. Individual craters may have expanded and merged to produce the extant depressions. Sublimation is a possible mechanism for this expansion. The presence of an expanded secondary chain in the northeastern portion of the quadrangle is consistent with our interpretation of the smooth material as volatile rich.

Summary: The Urvara Quadrangle is dominated by impact structures, large and small. We interpret two prominent catenae as pit craters associated with large scale tectonism rather than secondary impacts. We interpret two large curvilinear depressions near the eastern quadrangle boundary as secondary crater chains resulting from the Urvara impact. Textural and morphological asymmetries in crater materials throughout the quadrangle indicate heterogeneities in subsurface composition and volatile content. Features on the Urvara basin floor are consistent with impact fluidization of target materials; post impact extrusion of volatile rich material may have also played a minor role.

References: [1] Williams D.A. et al. (2014) *Icarus, 244,* 1-12. [2] Yingst R.A. et al. (2014) *PSS, 103,* 2-23. [3] Sizemore et al. (2015) *GSA Abstracts with Program,* Abstract 308-13. [4] Sizemore et al. (2015) *AGU Fall Meeting, P53E-2180*.

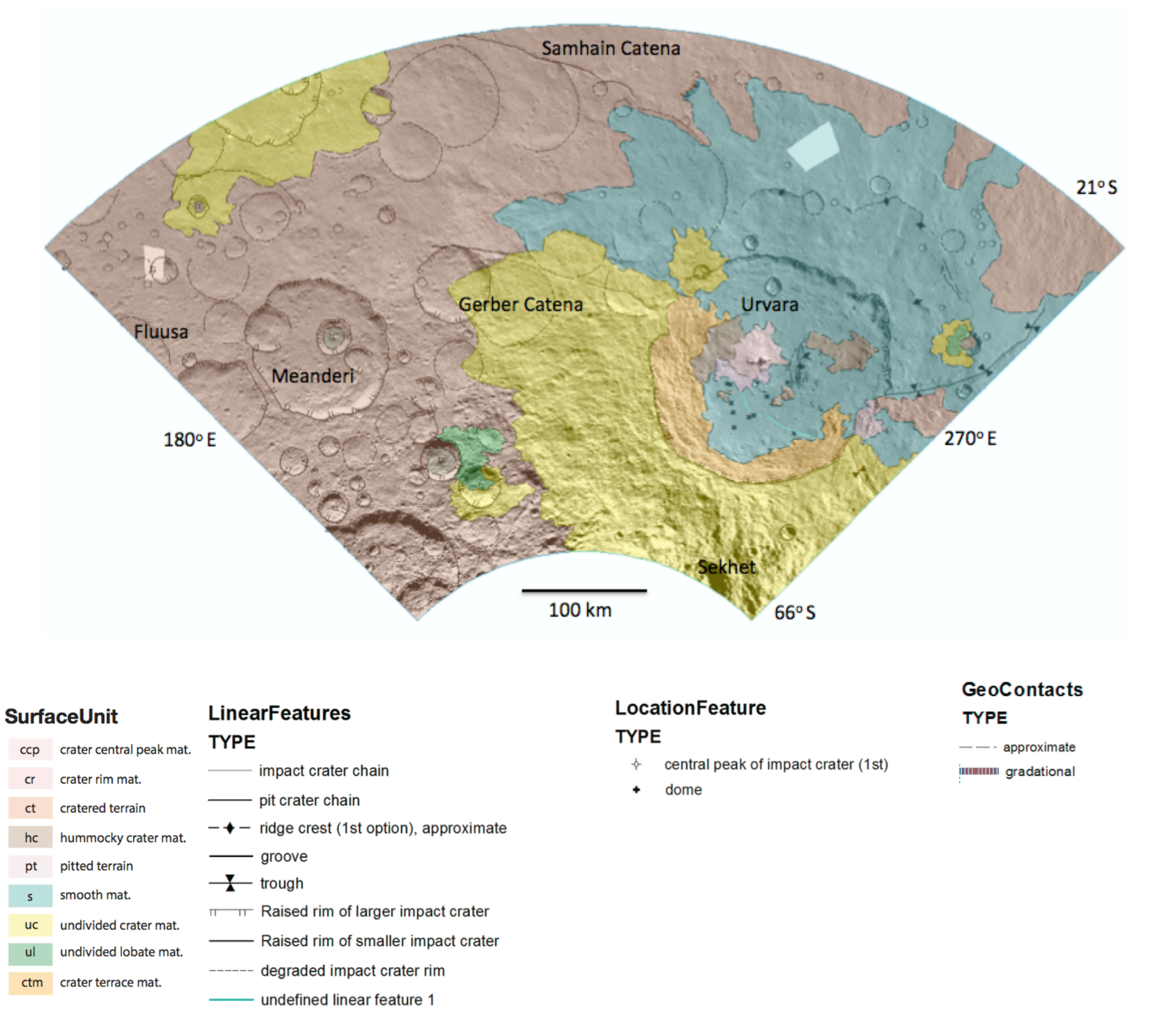

Figure 1: Geologic map of the Ac-H-13 Urvara Quadrangle of dwarf planet Ceres. Mapping base is Dawn FC HAMO mosaic (courtesy DLR).

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