LINKING EXPOSED STRATIGRAPHIC SEQUENCES ACROSS GALE CRATER: UPDATE ON AN 1:60K GEOLOGIC MAP OF WESTERN AEOLIS MONS. B. J. Thomson[1], L. S. Crumpler[2], K. D. Seelos[3], and D. L. Buczkowski[3], [1]Center for Remote Sensing, Boston University, Boston, MA (bjt@bu.edu), [2]New Mexico Museum of Natural History and Science, Albuquerque, NM, [3]Johns Hopkins University Applied Physics Lab, Laurel, MD.

Introduction: In this project, our objective is construct a geologic map of the western portion of the Aeolis Mons, the central mound in Gale crater, at 1:60K scale. The overarching goal of this research is to better understand the origin(s) of mound-forming and mound-draping layers. Were draping layers limited to a narrow depositional episode? Or are multiple cycles of deposition and erosion evident in the mound stratigraphy? Are all of the draping layers eolian, or are some the products of deposition in a lacustrine environment? The lower units of Gale are the subject of considerable interest because they capture a transition from an environment that favored phyllosilicate formation to an environment that favored the deposition of sulfate-bearing layers [1-3]. More detailed mapping of this transition zone will reveal if the transition was one-sided and irreversible [e.g., 4, 5], or if simultaneous or near-contemporaneous deposition of phyllosilicates and sulfate occurred [6].

Data and methods: The USGS has supplied a CTX mosaic (pixel spacing 6 m) of our study area, which measures about 45 km E-W and 67 km N-S. Additionally, HRSC, MOLA, and THEMSIS data were provided. As described last year [7], all 90 available HiRISE (High Resolution Imaging Science Experiment) images were manually combined into a single, semi-controlled mosaic tied to the CTX basemap. Available CRISM data over the study area has also been examined in survey mode to assess image quality; a limited subset of high-quality images has been examined in greater detail.

Geologic mapping in the our area is being conducted within a GIS framework and is proceeding in accordance with the Planetary Geologic Mapping Handbook [8] and established planetary mapping techniques [e.g., 9, 10, 11].

Figure 1. Contact between northern edge of Gale mound and floor material mapped by L. Crumpler. Embayment relationships indicate floor material superposes landslide material from mound.

Mapping results: Co-I Crumpler has completed an update to the initial reconnaissance mapping of the study area. A small portion of this mapping effort is given in **Figure 1**. Here, the contact between the floor material and the mound is delinated. The floor material clearly onlaps and embays the landslide material of the mound, consistent with prior interpretations that floor material is younger than mound [e.g., 12, 13]. Other landslide-like deposits have also been noted in the southern portion of the mound.

CRISM results: Co-I Seelos has examined all CRISM data over the study area and identified the subset of images with the lowest atmospheric dust opacity and strongest spectral signatures. These occur over the large canyon in the SW portion of the mound (**Figure 2**), and reveal a greater diversity of hydrated minerals than is often evident in the NW portion of the mound near the MSL landing site and *Curiosity* traverse. In **Fig. 2**, both monohydrated and polyhydrated sulfates are evident as indicated by yellow and magenta hues, respectively.

Submitted manuscript: In addition to mapping, we have also submitted a manuscript that presents a mass-balance analysis of the mound by comparing the volume of the mound to the missing volume eroded from the valley network system that drains into Gale. For this work, Co-I Buczkowski re-mapped the valley network segments from the global mapping study conducted by *Hynek et al.* [14]. Segment positions were updated due to the newly released, controlled THEMIS mosaic [15] and HRSC digital elevation models (DEM) with 50 m post spacing. Using the HRSC DEM, Co-I Buczkowski extracted cross-sectional profiles that were analyzed and compiled by Co-I Seelos. These results provide baseline measurements on typical channel cross-sectional area, measurements that when multiplied by the length of each channel provide an estimate of the eroded volume. PI Thomson drafted the initial manuscript describing the results, and all team members contributed to revisions.

Ongoing work: We plan to iteratively refine our geologic mapping and attempt to establish greater linkages between the units mapping in the SW with those in the NW. The scientific goal of the map is to identify, delineate, and characterize unconformable (mound-draping) units and unit packages, and to understand the differences between these units and in-place (mound-forming) units.

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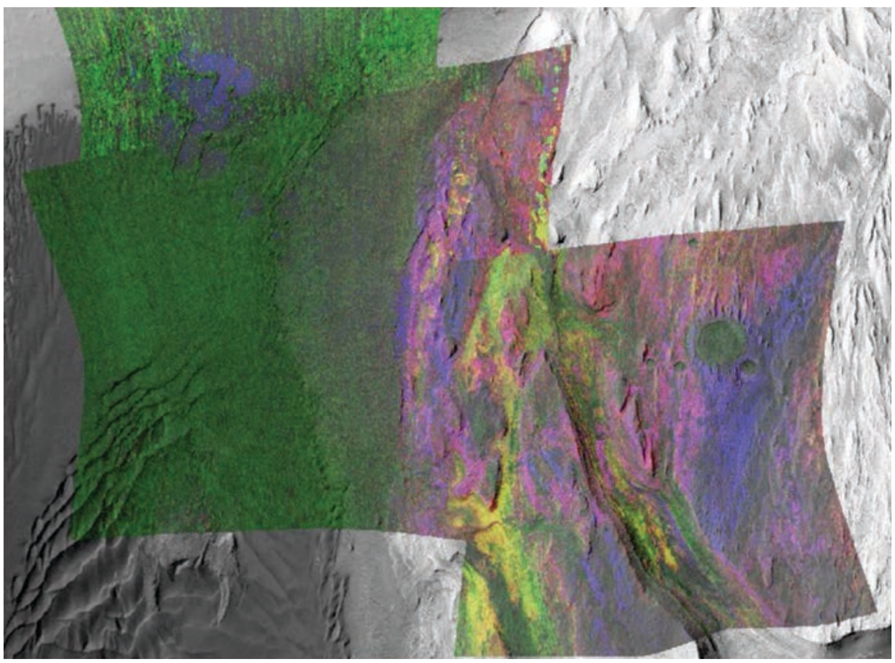

Figure 2. Mosaic of CRISM images over the SW portion of Aeolis Mons assembled and analyzed by K. Seelos. This RGB false-color composite emphasizes hydrated minerals (R: SINDEX2, G: BD2100_2, B: BD1900_2).