GEOLOGIC MAPPING IN MARGARITIFER TERRA ON MARS AND A CLOSER LOOK AT THE CONFLUENCE OF NIRGAL AND UZBOI VALLES. S. A. Wilson[1] and J. A. Grant[1], [1]Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution, 6th at Independence SW, Washington, DC, USA (wilsons@si.edu).

Introduction: Geologic mapping in Mars Transverse Mercator (MTM) quadrangles -20037, -25037, -30037 and -30032 in southern Margaritifer Terra encompasses Uzboi Vallis and the terrain south and west of Holden and Ladon basins (**Fig. 1**). This region preserves a long record of fluvial activity [e.g., 1-9] and mapping constrains the timing, source, duration and relative importance of aqueous and other geomorphic processes in shaping the landscape.

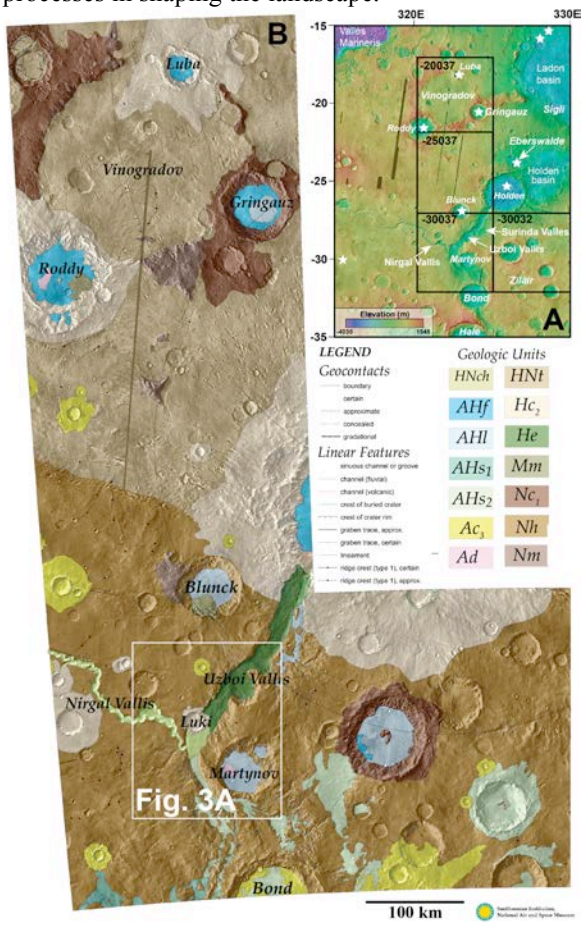

Figure 1. (**A**) Map quads cover from 17.5°S-32.5°S, 320°E-325°E and 27.5°S-32.5°S, 325°E -330°E (black boxes) and major place names. Stars mark craters hosting alluvial fans [e.g., 10-11]. MOLA over THEMIS day IR. (**B**) Preliminary geologic map at 1:1M scale.

Map Units - Oldest to Youngest (Figs. 1 and 2): *Plateau and Highland Materials.* High-standing bedrock remnants of the Ladon and Holden basin ring structures are mapped as Early to mid-Noachian Mountainous unit (*Nm*) [12]. The Noachian to Early Hesperian Highland unit (*Nh*) is heavily cratered, differentially mantled, contains older valley networks, grabens, and a few wrinkle ridges. In the walls of Nirgal Vallis west of Uzboi, a ~10 m-thick, laterally continuous Fe/Mg-smectite phyllosilicate-bearing layer is located a few meters below the surface of unit Nh and stratigraphically above Al-phyllosilicates [13-14]. Evidence of this phyllosilicate layer east of Uzboi is not observed [8]. The Late Noachian to Early Hesperian Terra unit (*HNt*) is characterized by widespread, smooth to rolling, cratered and variably dissected surfaces between degraded impact craters [5]. Unit HNt in MTM -25037 occurs beneath continuous Holden ejecta (unit Hc_2) and secondary craters related to the impact. The contact between units Nh and HNt are after [5].

Crater and Channel-Fill Units. The Late Noachian to Early Hesperian Channel unit (*NHch*) are eroded surfaces in Nirgal Vallis. The floor of Uzboi Vallis is mapped as Early to Late Hesperian Etched unit (*He*), characterized by erosionally resistant material exposed where aeolian deflation has partially stripped light-toned layered material [5].

Hale-related aqueous deposits [7-9, 15-17] in MTM -30037 and -30032 are mapped as Amazonian-Hesperian Smooth Units (AHs_1 and AHs_2). This Smooth Unit is intermediate to dark-toned, smooth at scales of 10s to 100s of m and varies in thickness. Unit AHs_1 has streamlined forms and channels closer to Hale and locally forms lobes with distinct margins in pre-existing valleys and topographic depressions [7-9, 15, 16]. Unit AHs_2 appears to drape higher topography and drains into lower lying terrain. Unit AHs_2 is dark-toned, fluted, fine-grained and thins with distance from Hale. This deposit can exhibit small fan-shaped forms as well as low longitudinal lineations that could be bedforms analogous to fluvial braiding. We interpret these to be aqueous deposits related to the formation of crater Hale. Unit AHs_2 may be related to emplacement of ejecta and (or) impact melt from Hale [18]. Some of these deposits likely formed as AHs_1 de-watered and are found well north and northeast of the Hale [17] in MTM quads -30037 and -30032.

The Late Hesperian to Early Amazonian Fan unit (*AHf*) are cone-shaped deposits on the interior slopes of some craters [5]. Distributary paleo-channel networks are preserved, most commonly in positive relief. We interpret *AHf* as alluvial deposits composed primarily of gravel and fines [e.g., 10] emplaced by fluvi-

al sediment transport with little to no obvious contribution by debris flows. The Late Hesperian to Early Amazonian Light-toned unit (*AHl*) are light-toned, fine-grained etched and eroded materials that occur on crater floors. Unit AHl may have been deposited in a playa environment.

Crater Units. The Noachian Crater 1 unit (Nc_1) are heavily modified with little to no preserved ejecta, whereas the late to Early Hesperian Crater 2 unit (Hc_2) includes moderately degraded craters with relatively continuous ejecta. Late Hesperian to Late Amazonian Crater 3 Unit (Ac_3) are "fresh" craters with well-preserved ejecta.

Surficial Deposits. The Hesperian to Amazonian Mass movement unit (*Mm*) is a single to multi-lobed shaped landslide deposit with distinct margins that occurs in craters Roddy and Blunck. Late Amazonian aged Dune unit (*Ad*) after [5] include typically dark-toned aeolian bedforms.

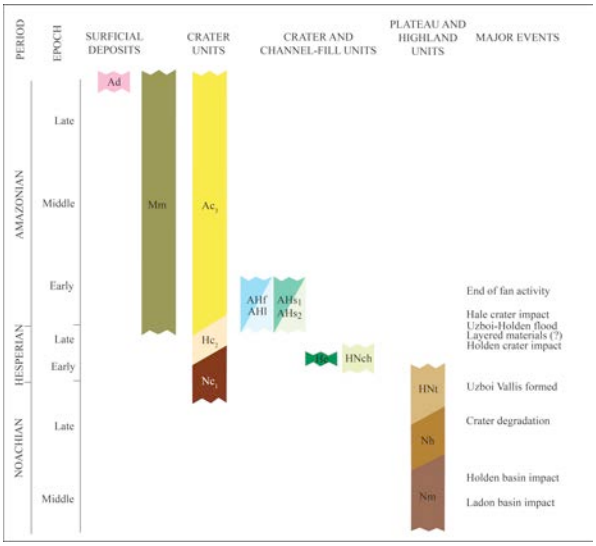

Figure 2. Preliminary correlation of map units.

The Confluence of Nirgal Vallis in Uzboi: The Noachian-Hesperian aged [1] Uzboi-Ladon-Morava (ULM) outflow system flowed from the northern rim of Argyre to the northern plains [1-4]. Uzboi Vallis is ~400 km long and is the southernmost segment of the ULM system. Evidence of Uzboi's probable southern outlet from Argyre basin was destroyed by crater Hale while the mid to Late Hesperian Holden crater [5] blocks the northern end of Uzboi. The formation of Holden created an enclosed basin in Uzboi that later flooded to form a large paleolake [6]. Finally, fluidized debris flows and associated deposits related to the Hale impact may have modified Uzboi Vallis and its southern tributaries [7-9, 15, 17] as late as the early-to-middle Amazonian [16]. The age of Nirgal Vallis relative to the evolution of Uzboi remains unclear, but post-dates initial incision of Uzboi because topography (**Fig. 3A**) reveals a fan shaped form (at the confluence of Nirgal and Uzboi) that is up to ~350 m thick based on the projected elevation of the Uzboi Vallis floor beneath the deposits (**Fig. 3B**). The location and orientation of the bulk of the deposits at the mouth of Nirgal implies they may be related to discharge from that valley. The deposit is not obviously related to impacts or material shed off the wall of Uzboi. The uppermost section of the Nirgal deposits are finely layered (**Fig. 3C**) but layers are less obvious lower in the deposit. Hence, the layering at the top of the deposit could be related to deposition associated with the lake in Uzboi [6]. If so, this would place the evolution of Nirgal Vallis after the initial incision of Uzboi but before the lake in Uzboi formed.

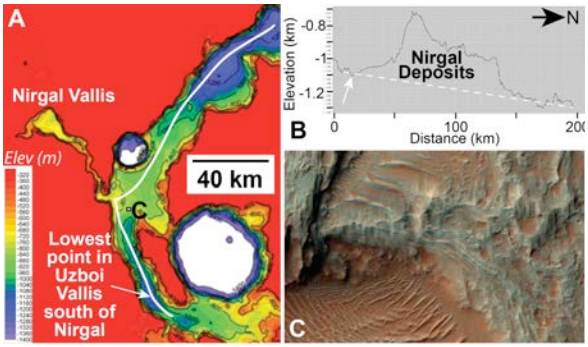

Figure 3. (A) MOLA topography (-320 to -1400 m) of Uzboi Vallis. White line is transect in (B), white box shows location of (C). **(B)** Profile along Uzboi floor in (A), arrow indicates lowest point in Uzboi south of Nirgal. White dashed line projects topography of the Uzboi floor beneath deposits from Nirgal Vallis. **(C)** Subframe of HiRISE ESP_042082_1495 (25.8 cm/pixel) showing layers on the surface of the deposits near the mouth of Nirgal Vallis. Scene is 650 m across.

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