INVESTIGATING THE ROLE OF AMAZONIAN MESOSCALE WIND PATTERNS ON THE SPATIAL DISTRIBUTION OF MARTIAN BEDROCK EXPOSURES. C. E. Gary-Bicas1, T. I. Michaels2, A. D. Rogers1, L. K. Fenton2, N. H. Warner3, and J. C. Cowart1, 1Department of Geosciences, Stony Brook University, Stony Brook, NY, 11790, Carlos.Garybicas@stonybrook.edu, 2SETI Institute, Mountain View, California, USA, 3State Univ. of New York at Buffalo, Dept of Geology, 876 NSC, Buffalo, NY 14260-3050.

Introduction: Areally-extensive (>15 km²) bedrock exposures throughout the Martian highlands have previously been mapped and documented using thermal and imaging datasets [1,2]. Highlands bedrock exposures exhibit THEMIS thermal inertia (TI) values higher than 500 Jm⁻²K⁻¹s⁻¹/2 (units hereafter omitted) and have relatively minor amounts of surficial sediment cover compared to typical highland surfaces [1,2]. Stratigraphic relationships and crater size-frequency distributions for these units indicate Noachian to Hesperian formation ages, but some units are too small to permit accurate formation estimates and could be younger [3].

A major question regarding these ancient bedrock materials relates to how they have been preserved and/or exposed. Cratering rates in the early Solar System should have generated approximate decimeter scale layers of regolith that would obscure ancient bedrock [4]; indeed, evidence of meter-thick regoliths have been observed at the Spirit and InSight landing sites [5-6]. One potential explanation for bedrock exposure is that the rock is friable, leading to outcrop deflation and continual removal of comminuted materials through wind erosion [3]. Though this is a working hypothesis for many bedrock exposures, not all such surfaces exhibit textural or crater ejecta characteristics consistent with friability [2,8]. Another potential explanation for present-day bedrock exposure is preservation through burial, and then later exhumation through more recent erosional processes. Finally, spatial variability in the energetics of Amazonian surface processes (e.g., wind) may have also played a role in bedrock exposure. Disentangling the competing roles of material properties and near-surface erosional processes is necessary for understanding the origin and preservation of ancient bedrock through the present day.

Figure 1: THEMIS/CTX/MOLA Topographic mosaic of Mars. Blue polygons indicate analysis regions working hypothesis for many bedrock exposures, not all such surfaces exhibit textural or crater ejecta characteristics consistent with friability [2,8]. Another potential explanation for present-day bedrock exposure is preservation through burial, and then later exhumation through more recent erosional processes. Finally, spatial variability in the energetics of Amazonian surface processes (e.g., wind) may have also played a role in bedrock exposure. Disentangling the competing roles of material properties and near-surface erosional processes is necessary for understanding the origin and preservation of ancient bedrock through the present day.

Figure 2: A) USGS map #3292 [7] of Tyrrella Terra showing Noachian highland units of different ages: early (eNh), mid (mNh), late (INh). Pink polygons correspond to mapped bedrock exposures [2]. B) MRAMS WEP map for climate state 1a (ε = 25.189°, Ω = 251°, ps = 7 mbar) for the same region.
In this work, we investigate the role modern mesoscale wind patterns play in creating and/or maintaining the present-day spatial distribution of exposed bedrock using the Mars Regional Atmospheric Modeling System (MRAMS) [9]. Wind erosive strength is parameterized as Wind Erosion Potential (WEP), which is derived from the mass flux from sand saltation as a function of wind shear velocity [10]. For multiple regions in the southern highlands, we addressed the following objectives:

a) Determine whether plains with bedrock exposure exhibit a difference in WEP from plains that lack bedrock exposure.

b) Determine whether there is a relationship between WEP and TI (used as a proxy for bedrock exposure).

**Data and Methods:** We selected ten different locations in the Martian highland terrains of varying age and surface type (Fig.1) based on map number 3292 from the United States Geological Survey (USGS) [7]. We cross-referenced these locations to mapped bedrock exposures [2] in addition to one region covering the Jezero mafic floor unit (MFU) [11] as well as locations between WEP and TI and MRAMS WEP were binned into equally-spaced grids and values were extracted for each of the units from each dataset. Histograms of WEP values were created for each mapped unit, and linear regressions of TI and WEP were calculated for all grids at each region to determine whether a predictive relationship between these two parameters is present.

**Results:** We conducted analyses at all ten study regions as well as the Jezero MFU [11] for all climate cases. We found that there are no clear distinctions for average WEP values and patterns between regions that contain bedrock versus regions that do not, with the exception of Noachis Terra 2 (lacks bedrock) that showed lower values than all other regions (Fig. 3). The MFU also showed lower WEP values than other regions. We found no correlations between TI and WEP for any for any of the 10 regions and any of the 13 climate cases.

**Conclusion:** There are no clear relationships between Amazonian mesoscale wind patterns and bedrock exposures within the regions studied. This suggests that differences in material properties [e.g., 2] between bedrock units and surrounding materials may exert a stronger control on bedrock exposure.

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