GEOLOGIC MAPPING OF THE DEUTERONILUS MENSAE REGION, MARS: IMPLICATIONS FOR GLACIAL AND FLUVIAL PROCESSES. L. Pauw[1], E. Hauber[2], and H. Hiesinger[1], [1]Institut für Planetologie, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 10, 48149 Münster, Germany, (l.pauw@wwu.de), [2]Institute of Planetary Research, German Aerospace Center (DLR), Rutherfordstr. 2, 12489 Berlin, Germany, (Ernst.Hauber@dlr.de).

Introduction: To this day, the distribution, morphology, and behavior of glacial and periglacial landforms have been used as key instruments to study small-to-large scale fluctuations in the global climate of Mars [e.g., 1-4]. The transition zone between the north-central parts of Arabia Terra and the Deuteronilus Mensae region hosts a variety of viscous flow materials that are comparable to morphologies of glacial environments [e.g., 1, 5-8], containing a record of mid-latitude glaciation and extensive mantling during the Middle Amazonian [4, 9]. Orbital radar sounding confirms relatively pure ice under a protective lag deposit of lobate debris aprons and lineated valley fill that are commonly observed in this region [10]. Our study area represents a volatile-rich and diverse exploration zone that spans large parts of the Martian chronology starting from Noachian-aged highlands up to Amazonian materials that possibly display relatively young activity. Here, we present a preliminary geologic/geomorphologic map that covers parts of the Arabia Terra bench as well as parts of the southern Deuteronilus Mensae region and, thus, provides detailed information about the local transition of the dichotomy boundary. Extending from E008/N36 to E024/N44, our map also contains materials that are related to Okavango Valles, Mamers Valles and Deuteronilus Colles. As a consequence, the number of units in this area is quite high and the complexity of the geomorphology is represented by large valleys, prominent channel systems, rampart craters, (peri)glacial landforms, degraded surfaces and various deposits of different grain sizes. High abundances of wrinkle ridges at the Noachian plateaus and stratigraphic evidence for early Martian explosive volcanism in Arabia Terra [11] indicate an ancient episode of geologic activity that must also be considered. Our goal is to create a map by using multiple datasets that summarizes all these features, considering the climatic conditions and geological processes throughout the history of Mars. Thus, our map should enable investigating this diverse region in unprecedented detail to reconstruct the geologic evolution.

Methods: We are mapping at a scale of 1:500,000 using ArcMap with five individual datasets to provide a high-resolution map of our research area: (1) THEMIS daytime for first visual and topographic assessments; (2) THEMIS nighttime to analyze the thermal heat conductivity of different materials; (3) CTX mosaics obtained by the Murray Lab website as a basis for mapping at a pixel-resolution of ~5.0m/pixel [12]; (4) HRSC data that provides a digital elevation model with a resolution of ~10-30m/pixel, and (5) HiRISE images to investigate small-scale textures and morphologies at ~0.5m/pixel. Our map is centered at 40°N16°E and covers an area of approximately 365,000km². We use a Lambert-Conformal-Conic coordinate system with a central meridian at 16°E and two standard parallels at 38°N and 42°N to provide the best fit for our mapping in terms of height and length measurements.

Preliminary Units: Since this study is work in progress, we do not perform any kind of interpretation for specific units yet, rather than elucidate the appearance and morphology of our so called "working units" that are preliminary assessments of our geologic map and partly inspired by Chuang and Crown (2009) [13].

Plateau material: Cratered highlands with channels, elongated depressions and secondary crater fields. It hosts rimless and infilled craters, sub-circular basins and well-preserved rampart craters. Crater density, elevation, and morphologies indicative of fluvial activity decrease towards north, whereas the abundance of surface collapse features, dissected highland blocks, mesas and remnant knobs located in the lower plains increase. High density of wrinkle ridges at the south-western highlands with increasing anomalies in albedo, texture and thermal signals towards west which might be related to Okavango Valles.

Plains material: Relatively smooth plains with variable albedo occurring in northern lowlands. Crater densities are lower than on highland materials. The plains display clusters of knobs and hummocky materials. Wind streaks at dark albedo areas are covered by a thin dust mantle, indicating modification by eolian processes.

Crater material: We divide ejecta blankets into smaller, well-preserved units that display pronounced lobes and blankets and large, moderately to highly degraded blankets that are partly superposed by younger craters. Crater rims are mapped if they show continuous rims with significant relief relative to the

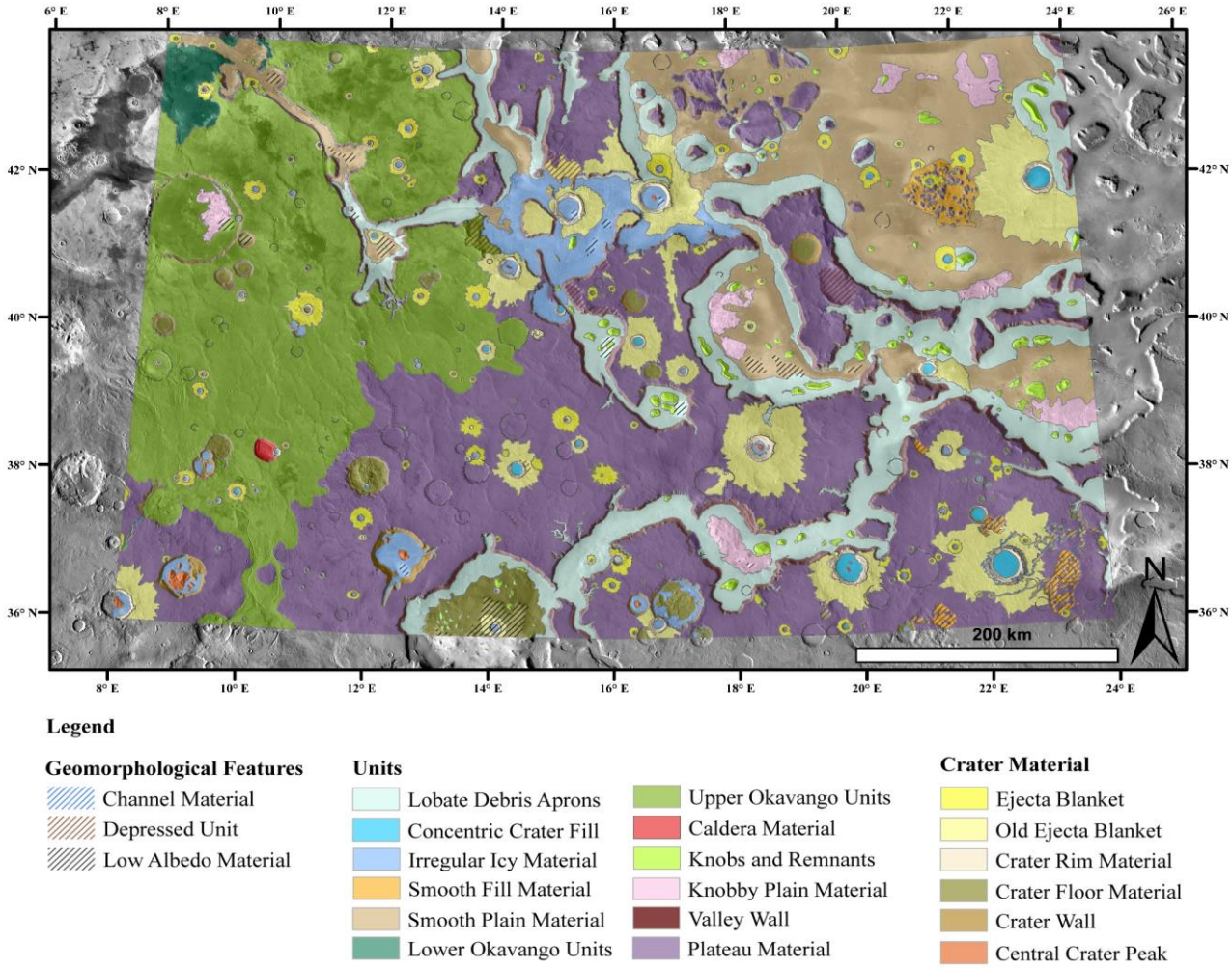

Figure 1: Preliminary map of our study area with a THEMIS daytime background image. Contacts and tectonic features are not included.

surrounding surface while varying in morphology across our research area. Crater floors are commonly covered with surficial fill material or glacial-like units like concentric crater fill and appear more diverse towards the western parts of the study area.

Surficial material: Lobate debris aprons surrounding mesas, knobs and extending from the bases of plateaus into valleys or lowlands. Lineated valley fill material with flow directions highly parallel to the curvature and orientation of valleys is also mapped, in this preliminary work, as the same unit as lobate debris aprons because both units show very similar behavior patterns and do not allow a clear differentiation. Smooth fill materials display mass-wasted deposits of small grain sizes that are embedded between blocks, knobs and channel systems.

Outlook and further work: In further steps we will create geomorphological maps and especially investigate the upper plateau units more precisely. This will enable us to classify the sequences of geological activities and to establish a detailed chronology. In addition, we want to use thermal and topographic data to investigate distinct features such as potential paleolakes, calderas and ash deposits.

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