GEOMORPHOLOGICAL MAPPING OF EASTERN ERIDANIA BASIN AND ASSOCIATED SUBBASINS, MARS. K. B. Golder and M. S. Gilmore, Dept. of Earth and Environmental Sciences, Wesleyan Univ., 265 Church St., Middletown, CT 06459 (kgolder@wesleyan.edu).

Introduction: The Eridania basin, defined by [1], is located in the southern highlands of Mars between Terra Cimmeria and Terra Sirenum. The basin is hypothesized to be the site of a large paleolake that was the source of the Ma'adim Vallis outflow channel [1]. The region was previously included in global maps [2,3] at a scale of 1:15M, and regional maps [4,5,6,7] at a scale of 1:5M. Our work focuses on the eastern margins of the Eridania Basin, including the subbasins Ariadnes Colles, Gorgonum Chaos, and Atlantis Chaos. We used contemporary image data to create a new geologic map of the region at ~1:1.4M scale and determined the timing of the sequence of events within the basin.

Methods: Mapping was performed on a CTX base map with areas lacking data coverage supplemented using HRSC and the THEMIS IR daytime mosaic. THEMIS IR daytime and nighttime mosaics were used to characterize units' relative thermal inertia values. MOLA topography was utilized to determine stratigraphic relationships between units and surface processes. MOC and HiRISE were used to identify meter scale surface features, to distinguish various mantling deposits. The map was produced with the ArcGIS software suite and is bounded between 170° and 195° E, 30° and 45° S.

Map Units: *Mountainous Terrain* varies from intermediate to high albedo, and forms high vertical relief isolated massifs and plateaus with irregular margins. The terrain exceeds 2000 m above the martian datum, with some regions reaching well over 3000 m. This unit is typically dissected by valley networks. *Interpretation:* The unit comprises the remnants of large impact crater rims, early uplifted and/or compressed material dating to the Noachian epoch [2,3].

Electris Terrain is typified by isolated, grouped or contiguous plateaus with distinct, steep scalloped margins that exhibit variable albedo and thermal properties. This unit corresponds to the Electris deposits mapped by [8]. The unit mantles large swaths of the mapping area and can exceed ~several hundred meters in thickness [8]. The unit is heavily dissected by valley networks that host extensive tributary systems. Layers exposed within large crater interiors indicate the possibility of multiple depositional events for this terrain type. Electris terrain is concentrated at elevations above 1100 m, with decreasing areal extent down to 500 m. Rare isolated plateaus are found below 500 m. *Interpretation:* Electris terrain is interpreted to be an ash airfall deposit blanketing the region [8].

Bright Electris Terrain consists of very high albedo material exposed within and along Electris plateaus, within chaotic terrain knobs, and beneath etched terrain. The material has the highest thermal inertia of the map units, indicating the material is well indurated or consolidated. The unit typically exhibits meter scale polygonal fractures, along with decameter scale interconnected filled fractures. Exposures of bright terrain are concentrated below 1100 m, though rare isolated occurrences are found above this elevation. In Ariadnes Colles, bright material is composed of phyllosilicates and sulfates in variable concentrations [9]. *Interpretation:* We hypothesize these are Electris materials that have been altered to form Fe/Mg rich smectites and sulfates.

Etched Terrain is characterized by low to intermediate albedo with a rough texture at the meter scale consisting of irregular hills and knobs. A minimum of 10 distinct members can be defined on the basis of thermal and morphological characteristics and stratigraphic position. The unit regularly terminates in lobate scarps, and subdues underlying topography. Etched terrain is concentrated within topographic lows (e.g., craters and basin interiors), is commonly associated with wrinkle ridges within basin interiors, and exhibits incised channels with occasional leveed margins. *Interpretation:* Lava flows formed during multiple eruptive events.

Chaotic Terrain is represented by fields of variable albedo mesas and knobs measuring 10s m to upwards of 50 km, bounded by linear to curvilinear fractures. Knob fields lie within the interiors of each of the 5 heavily degraded impact basins, and are concentrated below 500 m. Knobs exhibiting the greatest modification are found along the outer extremities of the knob fields, with greater preservation of plateaus found towards the center. Knobs are generally capped by a resistant etched unit. When the capping unit is missing, bright material is exposed, exhibiting morphology indistinguishable from the bright Electris unit. Two locations within Atlantis Chaos and an unnamed basin contain Electris plateaus that have been directly modified into chaos knobs. *Interpretation:* A previously continuous deposit modified by subsidence and erosion [10].

Gorgonum Benches are flat-topped benches with scalloped scarps found within Gorgonum Chaos. They encircle individual chaos knobs, and are restricted to below 0 m elevation. *Interpretation:* These benches are interpreted by [11] to have formed by lateral flow of sediment below the ice-water interface of a perennially frozen lake.

Major Structures. The *Sirenum Fossae* are a network of graben , generally <5 km width that trend ~E-W across the map area. These are radial to Tharsis and have been interpreted to be associated with magma emplacement in the Tharsis rise [12,13,14,15].

Valley Networks are recognized in mountainous terrain and have multiple branching tributaries. These generally initiate at a local drainage divide, and have v-shaped valley profiles supporting their formation via direct atmospheric precipitation and surface runoff [16]. Most valley networks in mountainous terrain continue directly into overlying Electris terrain. Ampitheater headwalls and flat valley floors within Electris indicate that groundwater sapping may contribute to valley formation [17] in addition to surface runoff.

The majority of valleys flow into (and rarely, between) the basins and there is no evidence for channel flow leaving the basins. Valleys are near ubiquitous in Electris terrain above 1100 m, and many increase in width (generally between 3 and 8 km) as they approach a common termination point at 1100 m. This has been noted by [1] as primary evidence of a regional paleolake. Although lower in number, valleys persist between elevation of 1100 m and ~500 m, and rare valleys occur below 500 m in the basin interiors. These valleys incise etched terrain, where their widths decrease to less than 1 km.

Stratigraphy: (Fig. 1) The stratigraphically lowest unit in the region is mountainous terrain which is directly overlain by Electris deposits. Valley networks modifed both units. The termination of the overwhelming majority of valley networks in the basins at elevations between 1100 and 500 m is consistent with a paleolake interpretation posited by [1]. Etched terrain embays these units. The relatively low density of valley networks on etched terrains indicates that valley network formation had lessened at this time.

The presence of etched terrain as a capping unit atop the chaos knobs, and the observation of Electris terrain transforming into chaos show that etched terrain emplacement predated chaos formation in each of the basins of the region. Sirenum Fossae graben dissect chaos knobs in 3 of the basins. Chaos formation occurred in each basin at the same stratigraphic level, forming after the emplacement and fluvial dissection of the regional Electris deposit and after the presence of the hypothesized paleolake. Etched terrain also embays chaos knobs and thus persisted after chaos formation.

The Sirenum Fossae have been constrained to have formed during the early Hesperian [15], requiring that each of the aforementioned events occurred in the Noachian to early Hesperian. This is consistent with the Noachian and Hesperian ages for the regional units from the 1:15M maps [1,2] and a mid- to late Noachian age for the Eridania basin [2,3] and paleolake [1].

The Electris airfall deposit has been dated to the Hesperian [8], but we argue based on our stratigraphy and the Sirenum Fossae age that it occurred in the late Noachian. Likewise, we maintain that the chaos, previously considered to be Hesperian to Amazonian [1,2] occurred in the late Noachian to earliest Hesperian.

The Gorgonum bench deposit has been interpreted to have formed during the Amazonian [11]. This is consistent with our stratigraphy. Valley networks are covered by this deposit which requires valley netwok formation ceased prior to the deposition of the benches. Thus our stratigraphy indicates valley formation initiated during the Noachian and continued through the Hesperian into the Amazonian.

Subsequent modification of the surface has been comprised of Amazonian aeolian and ice mantling processes [18].

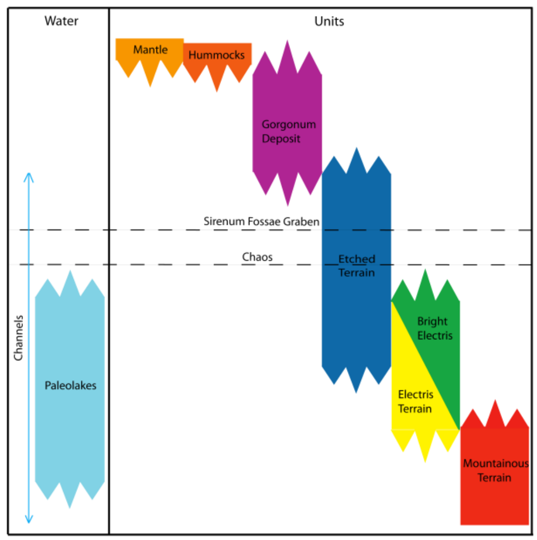

Fig. 1: Regional stratigraphy of map units and structures

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