STRATIGRAPHY OF THE ISMENIUS LACUS SE SUBQUADRANGLE: CLUES TO AN UPLAND/LOWLAND BOUNDARY FORMING EVENT?, Andrew M. Dimitriou, University of Massachusetts, Amherst, MA 01003.

The Ismenius Lacus SE (MC5SE) subquadrangle is located in NE Mars between 292.5°W and 315°W and 30°N and 47.5°N. Within this area, the global boundary between southern heavily cratered upland and northern sparsely cratered lowland is well exposed along a series of northwest trending scarps that approximate 1.4 km in mean height (1). To the northwest and southeast of the boundary defined by the scarps, areas of "fretted terrain" (2) make the upland/lowland boundary difficult to locate precisely. Geologic mapping based on Mariner 9 imagery was done by Lucchitta (3) over the entire MC5 quadrangle at a scale of 1:5M. This area was also covered in the 1:15M scale map of the Martian eastern hemisphere as compiled by Greeley and Guest (4). The purpose of this abstract is to present the initial results of a stratigraphic and tectonic study of this area using the highest available resolution Viking imagery as well as the published 1:2M photomosaic. By obtaining a detailed relative age sequence of the geologic units isolated, the fracturing and tectonic history of this key upland/lowland boundary area can be constrained more precisely than before. The cumulative crater plots generated were compared with the Neukum and Hiller curve (5) and stratigraphic ages assigned with reference to Tanaka (6).

Within the uplands, a distinctive population of "rimless" craters is recognised which has also been noted in Amenthes (7). It is assumed here that these craters represent an old population lying at a relatively uniform depth beneath the present plateau surface units. When relative ages are determined, either by considering the plateau surface as a whole or by separating populations based on the observable geologic units, counts of "rimless" craters yield an Early Noachian age.

Above this ancient surface, a number of geologic units can be identified based on differences in surface morphology. A smooth plateau unit is located along the fretted northern boundary of the plateau and as a capping unit on the outlying mesas. This is interpreted as being volcanic and/or aeolian material and yields a crater age of Early Amazonian. The smooth plateau unit truncates a boundary between two units tentatively interpreted as volcanic, the most extensive of which is identified as ridged plateau. It lies in the central portion of the upland in this subquad and is characterised by the presence of low relief irregular scarps; crater counts yield a Early Hesperian age although the counts also indicate that lava may have continued to flood this surface with decreasing volumes into the Early Amazonian. The ridged plateau is fractured and truncated along its eastern margin by boundary scarps which separate upland from lowland materials. The second unit truncated by the smooth plateau is characterised by a hummocky surface at km scale and is thus identified as hummocky plateau. This is located in the central and eastern portion of the upland where its eastern margin is also dissected and truncated by boundary scarps. Crater counts yield an Late Hesperian age for this unit.

A complexly eroded unit is identified in the southern region of the subquad as etched plateau. The boundary between this and the ridged plateau is characterised by erosional rather than depositional processes. Here, the visible etched unit consists of ridged and possibly smooth plateau material that has been differentially eroded in a complex manner leaving irregular and circular positive relief landforms. Crater ages from this unit yield Early Amazonian ages, but this relative youth is almost certainly due to removal of craters by the complementary processes of erosion and deposition, the stratigraphic age of the materials visible is older. These erosional and depositional processes have neverless allowed a fairly clear boundary to be drawn between the etched and ridged units.

Within the lowland along the upland/lowland boundary, a unit which is characterised by the presence of bright, very sparsely cratered material is identified. This unit includes debris aprons present at the base of the scarp and of many outlying mountains and also bright deposits mantling the floors of fractures and irregular valleys penetrating into the uplands. Crater counts proved impossible on this unit due to the small number of superposed craters present.

North and west of the boundary scarp, three lowland plains units are identified: a smooth plains unit, a very smooth plains unit and an etched plains unit. Crater counts are only possible

ISMENIUS LACUS STRATIGRAPHY: Dimitriou, A.M.

on the first two units and yield ages between Early and Middle Amazonian. The latter unit does not have a large enough exposed area within the mapped area to permit crater counting. The morphological differences between the first two units is based on the relative abundance of small mountains that are scattered through the lowland plains. These mountains are inferred to represent inliers of older material. Within the areas where these mountains abruptly decrease in abundance practically to zero the very smooth plains unit was identified. The differences in mountain abundance are taken to represent variations in sub-plains basement elevation. The etched plains unit is characterised by the presence of small (< 10km long axis) cuspate positive relief features that suggest differential erosion of plains materials.

A unit that consists of isolated large groups of mostly rounded mountains scattered in a wide zone roughly paralleling the present trace of the upland/lowland scarp is interpreted to be remnants of an older surface that has been partially buried and embayed by the unconformable younger plains materials. Crater remnants are visible in many cases and counts over these areas yield a population that fits the Neukum and Hiller production curve (5) very well. The age determined is Early Noachian. Therefore, the surface that lies at a shallow depth on the plateau is also present at a shallow depth in the lowlands, an elevation difference of at least 1.4 km.

In order to account for this observation, work is in progress attempting to model this as an area which experienced crustal downwarping, or normal faulting causing downthrow to the northeast. These models must also take into consideration the timing of the event. Because some of fractures cut upland surfaces the faults are inferred to have initiated around the Late Noachian/Early Hesperian boundary, which is significant for the timing of the origin of the dichotomy boundary itself in this region of Mars.

This region is a key area of the upland/lowland boundary, due to the exposure of a wide age range of materials. The work done and the modelling in progress enables better constraints to be placed on the timing and nature of this portion of the global dichotomy.

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