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THE FRETTED TERRAIN OF THE NILOSYRTIS MENSAE REGION OF MARS: CLUES TO THE TIMING OF DICHOTOMY FORMATION AND THE EMPLACEMENT OF THE NORTHERN PLAINS; Jeff E. DeTroye, *Mail Code AC, Johnson Space Center, Houston, TX 77058* and Steven H. Williams, *Department of Space Studies, University of North Dakota, Grand Forks, ND 58202* .

Geologic mapping of the fretted terrain of the Nilosyrtis Mensae region of Mars has revealed geomorphic evidence that the breakup of the plateau units to the south of Nilosyrtis occurred well before the plains units to the north were emplaced in late Hesperian time. The plains units were deposited against the fretted terrain, which has undergone some modification by mass wasting but not significant backwasting. The morphology observed at the contact between plains and the fretted terrain is consistent with that expected where the edge of a pile of sedimentary debris has undergone mass wasting and other erosion.

The Nilosyrtis Mensae region of Mars provides morphologic clues to the timing of two important events in martian geological history: the formation of the martian global crustal dichotomy and the emplacement of the northern plains. A preliminary geologic map at 1:500,000 scale of MTM quadrangle 35297, covering a box between latitudes 32.5 to 37.5° and longitudes 295 to 300°, was prepared to facilitate understanding of the sequence of geological events associated with the dichotomy boundary.

The plains units to the north of the Nilosyrtis Mensae are mapped by Greeley and Guest as HNu, undifferentiated materials of Noachian/Hesperian age [1]. The plains in the study quad more closely resemble the unit Hvk in [1], knobby plains of Hesperian age, part of the Vastitas Borealis formation. The plains are of late Hesperian age as determined from their N(5) crater population [1,2]. An additional age constraint is that the plains contain what are probably secondary craters from the Lyot impact basin [2], of early Amazonian age [3]. The nature and timing of dichotomy formation and plains emplacement places significant constraints on models of both internal and external processes (see [4, 5] for review). Questions addressed in this study include: When did the breakup of the plateau units on the dichotomy boundary into the fretted terrain occur? and: Has there been any appreciable retreat southward of the dichotomy boundary?

The portion of the contact between the Hvk plains and the fretted terrain contained within the study area is shown in Figure 1. There are several craters whose morphology indicates emplacement after the formation of the local mesas by the breakup of the plateau. Yet these craters clearly predate the emplacement of the Hvk; at one location (figure 1), a crater lies astride the contact between the Hvk plains, which bury its ejecta, and the mesas, upon which ejecta and scour are still visible. No similar craters can be found on the adjacent Hvk plains; presumably all such craters that were there were buried as thoroughly as was the ejecta blanket of the crater the plains partially bury (Figure 1). The plateau units to the south contain approximately the same distribution of younger craters. Unfortunately, the area in question and the number of craters involved are too small for accurate statistics, however, it is not likely that a geologically-short amount of time transpired between the formation of the frets and the emplacement of the Hvk plains because there are many craters of the 10-15 km size superimposed on top if the frets and none on the Hvk plains. Some mass wasting has occurred relatively recently on the mesas, as evidenced by the obliteration of ejecta that must have been plastered on their sides during emplacement (Figure 1), but there is little evidence that the fretted terrain has undergone much further erosion since the craters on them were formed. If backwasting occurred after plains emplacement, a similar population of craters would be expected for both the plains and the fretted terrain.

The edge of the Hvk plains at the point where the partially-buried crater is covered is fairly thick, on the order of hundreds of meters or more (Figure 1). If the fretted terrain to the south was fully developed when the Hvk plains were emplaced, then the observed thickness of the plains reflects the original thickness of the deposit; as there would have been no barrier to act as a margin for the plains units and there is a relatively steep southward facing scarp at the contact. So it is likely that the plains margin was formed primarily by a single deposit rather than several thin units being emplaced with them all stopping at the same location without further overrunning the partially buried crater.

REFERENCES:

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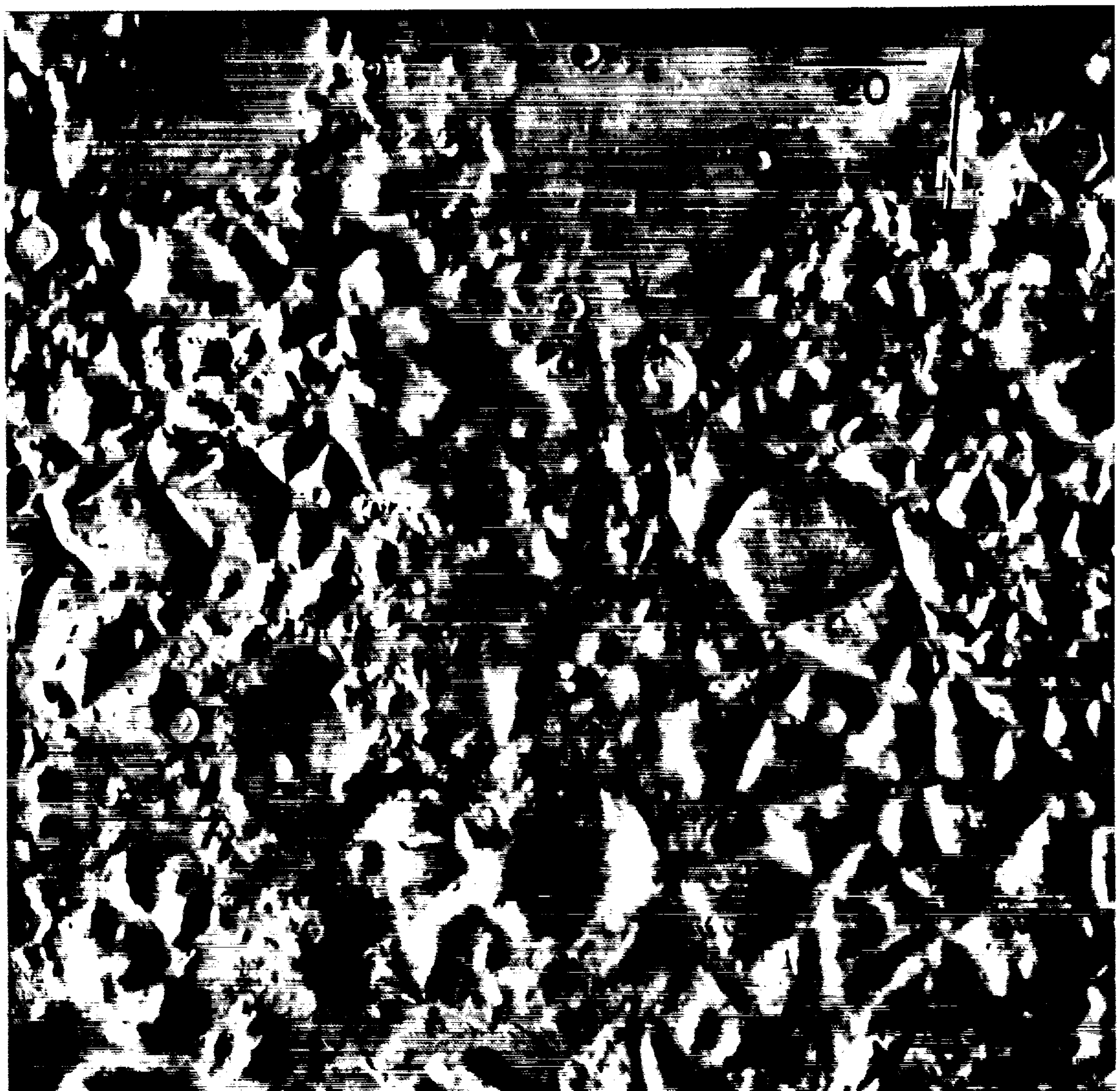

Figure 1. Shown is a section of martian fretted terrain in the Nilosyrtis Mensae area that lies between the Hvk unit of the northern plains assemblage and the Noachian age plateau units to the south. One crater (dark arrow) is partially overridden by the plains; its ejecta is partially covered by plains materials yet its rim allowed little, if any, material to flow into the crater directly.