GEOLOGIC AND STRUCTURAL FEATURES OF THE ELYSIUM MONS CALDERA. Kathleen McBride, University of Houston-Clear Lake and Lunar and Planetary Institute, 3303 Nasa Road 1, Houston, Tx., 77058.

A detailed study of the Elysium Mons caldera using high resolution (35 m/pixel) Viking orbiter image 117A21 has revealed many interesting features. Image processing techniques were used to aid in the description and interpretation of structural features and geologic units of the caldera.

Elysium Mons stands 13 km above the surrounding plains and has lateral dimensions of up to 500 X 780 km [1]. It has a perfectly circular, single, central caldera measuring 14 km in diameter. This is much smaller than other martian calderas when compared to the basal dimensions of the volcano. Most martian volcanoes have larger, nested caldera complexes, indicating variable eruption histories [2].

Southeast of the caldera rim is a crater measuring 5 km in diameter. This crater has been interpreted as being of impact origin due to its raised rim [3]. However, it is not completely circular; there is evidence of slumping or mass wasting along its eastern rim. It also contains a large central pit which is uncharacteristic of an impact crater of this size.

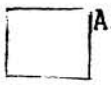
On the northern side of the caldera is a tectonic depression that breaches the rim. This depression and the impact crater to the southeast are connected by a linear chain of craters extending across the caldera interior, indicating possible tectonic control. These craters lack visible rims and are thus interpreted to be endogenic in origin. There are many other pits and crater chains radiating outward from the caldera [3]. These are also believed to be endogenic in origin, formed by the collapse of lava tubes or collapse along rift zones. The material around the summit appears smooth with no lava flows visible near the rim [2].

Further processing may bring out additional details that will aid the description and interpretation of Elysium Mons.

UNIT DESCRIPTIONS AND INTERPRETATIONS (Unit Ael2 [4])


A5 Depression Material-This unit is composed of the circular depressions contained within the unit A4. These depressions follow the trend between the circular tectonic feature to the northwest and the crater southeast of the caldera. Interpretation: These are the fifth collapse events of the caldera. They represent the final stage of summit activity of Elysium Mons.


A4 Floor Material- The floor is relatively flat and smooth. There are no visible flow fronts at 35 m/pixel. Interpretation: This unit may represent lava flooding following the fourth collapse (unit A4) of the caldera.


A3 Slump Material-This material is smooth becoming slightly hummocky near the floor on the east and west sides of the caldera. Interpretation: Faulted volcanic material forming flat mounds, with talus accumulation. This unit is the third material produced by caldera collapse.

A2 Western Rim Material-Arcuately shaped, smooth walled escarpment with no visible texture. It is located on the northwestern side of the rim and is superposed by units A3 and A4. This unit includes the circular tectonic depression to the northwest. This depression breaches unit A1 and is continuous with the linear depressions in unit B4. Interpretation: Faulted volcanic material, probably with some talus accumulation or mass wasted material. This unit is the second material produced by caldera collapse.

A1 Northern Rim Material-Arcuately shaped, smooth walled escarpment with no visible texture. It cuts into unit B4 and is superposed by unit A2. It is located at the top of the nothern half of the rim. Interpretation: Faulted volcanic material, probably with some talus accumulation or mass wasted material. This unit is the first (oldest) material produced by caldera collapse.

REFERENCES: [1] Blasius and Cutts, Icarus 45, p.87-112, 1981. [2] Mouginis-Mark, LPSC 12, p.726-728. [3] Malin, Geol. Soc. Am. Bull. 88, p. 908-919, 1977. [4] Greeley and Guest, Map I-802-B, USGS, 1987.