VERY YOUNG VOLCANIC, LACUSTRINE, AND FLUVIAL FEATURES OF THE CERBERUS AND ELYSIUM BASIN REGION, MARS: WHERE TO SEND THE 1999 MARS SURVEYOR LANDER. K.S. Edgett1 and J.W. Rice, Jr.2, 1Department of Geology and 2Department of Geography, Arizona State University, Tempe, Arizona 85287.

Introduction and Summary: The Elysium Basin region (10°S - 20°N, 170°W - 230°W), which includes the low albedo Cerberus feature and the Marte Valles channel system, has some of the youngest volcanic and fluviolacustrine landforms on Mars [1-3]. Viking images show that the Cerberus Rupes fractures were probably the source for some of the water and volcanic material which shaped this region. One lava flow that emanates from the Cerberus Rupes is so young that it still has a low albedo (it is not chemically weathered or covered by dust) [4]. The presence of both water and volcanism during the Late Amazonian in this region make it a favorable site for the Mars Surveyor lander being planned for launch in January 1999, provided that the mission emphasis is on the mineralogy and chemistry of sediments of relatively recent lacustrine and/or hydrothermal origin. With the potential for landing sites in mind, specific key features in this region should be targeted for observations by the 1996-launch Mars Global Surveyor camera and thermal emission spectrometer.

Young Stuff: Two main papers summarize the geomorphology of the Elysium Basin region. The first, by Plescia [1], emphasizes volcanic geology, the second, by Scott and Chapman [2] describes lacustrine and fluvial features. There is disagreement between the two papers as to how some of the landforms should be interpreted, but both indicate that the region has some of the youngest geologic materials on Mars. Based on crater counts, the material in Elysium Basin is probably less than 700 million years old [1].

More (New) Young Stuff: Here we add three new items to the list of apparently young features (Figures 1-3). The three features are associated with the Cerberus Rupes, a set of fractures which cut across most landforms in the region. Figure 1 shows a low-albedo lava flow that emanates from one of the Cerberus Rupes fractures (see arrows). The lava flow is darker than the sand which comprises the Cerberus low albedo region (dark streaks in Figure 1). The lava flow in Figure 1 thus has an albedo of <0.10; to our knowledge, this is the only such dark flow on Mars and indicates that it is so young that it has not weathered (oxidized) or been covered by dust. Figure 2 indicates streamlined features formed by fluvial erosion (arrows). The streamlined features occur just southwest of one of the Cerberus Rupes fractures, and probably resulted from the release of water from the fracture system some time after the sea that once filled part of Elysium Basin [2] had largely dried up. Figure 3 shows a dark deposit surrounding one of the Cerberus Rupes fractures (arrow). Several fractures in the region have similarly associated dark, semi-elliptical deposits (modified by wind) that resemble the pyroclastic deposits seen on the Moon and Io. It appears that the Cerberus Rupes fractures have served as a very Late Amazonian source for lava, pyroclasts, and water.

Landing Site Potential: In April 1994, there were no less than 8 proposals to land Mars Pathfinder somewhere within the Elysium Basin region [5]. The proposals stressed proximity to volcanic materials [4, 6, 7], lacustrine deposits [4, 8-11], fluvial "grab bag" deposits [10], aeolian sands [4, 12], weathered highlands [12], and possible chemical sediments indicative of climate history [11]. The Elysium Basin region needs further study. Especially needed are high resolution images (perhaps from the Mars Global Surveyor camera) of the apparently young features associated with the Cerberus Rupes fractures. If it is true that these fractures have been the source of water and volcanic material in relatively recent martian history, then this area might be an exciting place to look for hydrothermal deposits and young lake bed features, consistent with the potential objectives of the 1999 Mars Surveyor lander as suggested by some of the desired scenarios presented at the Mars Pathfinder landing site workshop in 1994.
ELYSIUM BASIN REGION: Edgett, K.S. and Rice, J.W., Jr.


Figure 1. Low albedo lava flow emanating from Cerberus Rupes fracture (arrows). Viking image 883 A 04, 06.

Figure 2. Fluvial streamlined features occurring downslope and southwest of Cerberus Rupes fractures. Fractures not shown here. Viking image 883 A 30.

Figure 3. Dark material at Cerberus Rupes fracture. Possible pyroclastic deposit modified by wind. Viking 385 S 23.