Regional geologic mapping from Viking images has revealed numerous moderate-size to large volcanoes and long fissure vents in the Thaumasia and Phaethontis quadrangles of Mars. These features lie to the south and southwest of Tharsis Montes but they are far removed from the giant shield volcanoes, and are considerably older. As now mapped, more than 20 volcanoes and vents are concentrated in three general areas, each covering about 1.0 million km² (Fig. 1).

1) **Thaumasia Fossae** - this eastern region is characterized by a dense complex of intersecting faults and grabens that transect the cratered highlands in NNW and NNE directions [1]. A large part of the area has been flooded by older flows from Arsia Mons [2], which have embayed some of the volcanoes and buried most of the fault systems. Because most volcanoes also cover the faults, volcanoism must have occurred after major faulting but before eruptions in the Tharsis Montes. The volcanoes range in width from about 50 km to 100 km or more across their bases, have low relief, and radial ridges and troughs extend down their flanks; lava flow fronts and deeply incised drainage patterns are visible in places. Calderas and summit craters are present but not common; a few of the structures lie along northwest-striking faults.

2) **Central region** - the largest group of volcanoes is located in the eastern part of the Phaethontis quadrangle and the western part of the Thaumasia quadrangle, centered near 40° S., 125° W. The region is dissected by northeast-trending grabens but the volcanic structures, with one exception, are aligned northwest-southeast at nearly right angles to major faulting; wrinkle ridges in lava plains also have dominantly northwest-southeast directions. Large calderas, 75 km long or more, are common, as are linear collapse depressions along fault zones. In this area too, the volcanoes and their ejecta are mostly younger than the complementary fault systems but older than early lava flows from Arsia Mons.

3) **Sirenum Fossae** - many of the volcanoes in the northwestern part of the Phaethontis quadrangle are oval shaped, exceptionally large (up to 250 km long), and aligned along or transverse to major fault directions. Some of the volcanic structures more nearly resemble fissure vents with ramparts built up along their margins; others consist of overlapping and coalescing craters, one of which was recognized on the Mariner 9 pictures [3]. A few volcanoes have steep sides and bold relief; they may be composite structures formed by lava flows with interbedded pyroclastic deposits. Some large (200 km across), circular, and nearly rimless structures do not resemble impact craters. Their margins are commonly marked by fissure vents and crater chains similar to those mentioned above. They have raised floors consisting of chaotic blocks and knobby material surrounded by overlapping dark plains of probable basaltic lava flows, as interpreted elsewhere on Mars. If these structures are of volcanic rather than impact origin, they raise interesting
MARS: HIGHLAND VOLCANIC PROVINCE
Scott, D. H. and Tanaka, K. L.

possibilities for similar appearing features in other areas of the highlands.

References
MARS: HIGHLAND VOLCANIC PROVINCE

Scott, D. H. and Tanaka, K. L.

Figure 1. Geologic sketch map highlighting volcanic features south of Tharsis Montes region of Mars. Scale 1:30,000,000; map width exceeds 5000 km.

EXPLANATION

- **h**: Highland terrain
- **r**: Riddled plains material
- **p**: Plains material
- **k**: Knobby and chaotic material
- **v**: Volcanic structures
- **t**: Caldera or collapse depression
- **f**: Fault or graben
- **g**: Stream and/or possible gully

© Lunar and Planetary Institute • Provided by the NASA Astrophysics Data System