POSSIBLE CORONAE STRUCTURES IN THE THARSIS REGION OF MARS; **K. L. Tanaka[1], J. M. Dohm[1]**, and **T. R. Watters[2]**; [1]U.S. Geological Survey, Flagstaff, AZ 86001, [2]CEPS/NASM, Smithsonian Institution, Washington, DC 20560.

Coronae, as defined on Venus [1, 2], constitute broad (several tens to hundreds of kilometers across) circular to elliptical topographic features with associated volcanism and radial and concentric tectonic structures. On Venus, coronae vary widely in character and size; they appear to be structures formed by rising mantle diapirs that produce uplift and relaxation of the lithosphere and commonly volcanism [e.g., 2, 3]. Three similar structures have been recently proposed for Mars [4]. Here, based on a preliminary reconnaissance, we propose that as many as 15 coronae occur in the Tharsis region of Mars (see Fig. 1 and Table 1). Most of these have been previously interpreted as the sites of deep-seated intrusives [5]. Alternatively, some may be controlled or formed by impact, collapse, or other geologic processes. (In Table 1 and Fig. 1, we query the ones whose interpretation is particularly sketchy). Here we describe their topography, structure, volcanism, and relation to the broad Tharsis rise.

The proposed Martian coronae range from >100 to nearly 900 km across (see Table 1). We have named each one by using the names of associated geographic features. Most have roughly circular but incomplete raised rims. The coronae may be partly buried or embayed (e.g., Syria and Fortuna), dissected by broad canyons (e.g., Echus and Nia), or interrupted by dense fracture belts (e.g., Alba, Ceraunius, and Tempe north and south). Most have concentric and exterior radial grabens, whereas three in Terra Sirenum (Atlantis north and south and Gorgonum) are defined by concentric wrinkle ridges and scarps (which may be produced by normal faulting or differential erosion of resistant, tilted beds). Several include interior volcanism, as follows: (1) Syria and Alba have interior plateaus and summit collapse features (calderas, pits, and rilles); (2) Acheron, Ceraunius, and Halex have collapsed interiors marked by volcanic vents and flows; and (3) Tempe south has little tectonic relief but a prominent interior volcano.

Although Fig. 1 shows little clustering of the postulated Martian coronae, many occur along prominent fracture systems. In particular, (1) Alba and Ceraunius coronae partly define the Alba-Ceraunius Fossae fracture belt; (2) Tempe north and south and Labeatis coronae occur along Tempe Fossae; (3) Syria and Nia coronae lie, respectively, at the west end and center of Valles Marineris; and (4) Acheron, Halex, and Ulysses coronae align with a possible fracture belt (largely buried) that connects Ulysses and Acheron Fossae. Thus, all major extensional regions of Tharsis (with the possible exception of Thaumasia) include possible coronae. The five remaining coronae (all queried) appear isolated from fracture systems.

We find both similarities and differences between the Martian and Venusian coronae. Both have (1) similar diameter ranges, (2) annular topographic rims cut by concentric grabens, (3) highly variable topographic and tectonic character, (4) associated volcanism, and (5) many located along major fracture belts. In contrast, many of the Martian coronae show much lower structural intensity and complexity, a lack of well-defined moats or outer trenches, and less associated volcanism than do their Venusian counterparts. Many of the differences between Martian and Venusian coronae may be due to the generally greater thickness of the Martian lithosphere [4].

Our understanding of coronae origin and evolution should expand through comparison between their conditions of formation and geologic expression on Venus and Mars. In addition, the potential lifespan of these structures may be evaluated by studying the cratering histories of some of the Martian coronae (not possible for Venusian coronae); some may be long-lived (e.g., Alba and Syria [6, 7]). Finally, the identification of possible coronae in the Tharsis region of Mars may help to explain the deep-seated processes that control the heterogeneity of tectonism therein [e.g., 8, 9]. In future work, we will describe Martian coronae in greater detail and attempt to model their formational history.

CORONAE ON MARS: **Tanaka K.L. et al.**

Table 1. Possible Mars coronae: Center location, size, and topographic, structural, and volcanic characteristics.*

Name	Lat (°N)	Long (°W)	Diam. (km)	Comments
1. Alba	41	110	750 x 600	Interior plateau, 3-4 km relief; concentric grabens, radial grabens aligned with Alba Fossae, interior radial wrinkle ridges, summit calderas; radiating lava flows
2. Tempe north	42	76	250–300	Low relief; concentric grabens, radial grabens aligned with Tempe Fossae
3. Tempe south	37	74	250–300	Low relief; concentric grabens, radial grabens aligned with Tempe Fossae; interior volcano and lava flows
4. Acheron	34	135	>800 x >600	Raised northern rim, 1 km relief; concentric and radial grabens, possibly along Ulysses fracture belt, interior wrinkle ridges; large possible fissure vent on rim
5. Ceraunius	30	108	725 x 500	Low relief; two shallow interior depressions; concentric grabens, radial grabens aligned with Ceraunius Fossae; interior lava plains and small shields and fissure vents
6. Halex	28	127	>100	Largely buried by lavas; depressed center; concentric grabens, interior volcanoes and radiating flows
7. Labeatis (?)	29	83	300	Slightly raised rim; concentric grabens; interior flooded by lavas
8. Ulysses (?)	7	121	450	Slightly raised rim; subtle concentric grabens, radial grabens; partly flooded by lavas
9. Fortuna (?)	6	98	>600	Largely buried by lavas; concentric grabens
10. Echus (?)	3	80	>450	Partly preserved; interior slightly depressed; concentric grabens, minor radial grabens; cut by Echus Chasma
11. Syria	-13	103	875 x 525	Raised northern rim, 1-2 km relief; concentric and radial grabens aligned with Claritas Fossae and collapse troughs, summit collapse depressions, concentric wrinkle ridges; flood lavas from interior bury SE rim
12. Nia (?)	-12	71	350–400	Southern rim in slight topographic low, remainder cut by Melas Chasma; concentric and minor radial grabens
13. Atlantis north (?)	-35	177	230	Raised rim, depressed interior; concentric scarps (cuestas and (or) normal faults), interior concentric wrinkle ridges; interior chaos; volcanoes on NE and SW parts of rim
14. Atlantis south (?)	-38	176	215	Partly raised rim; concentric wrinkle ridges; degraded rim material, interior chaos; volcanoes on NW and E parts of rim
15. Gorgonum (?)	-37	170	240	Depressed interior; concentric wrinkle ridges; interior chaos

*Queried where interpretation is highly uncertain; for partly buried coronae, location and diameter estimated based on projected outline of corona (see Fig. 1).

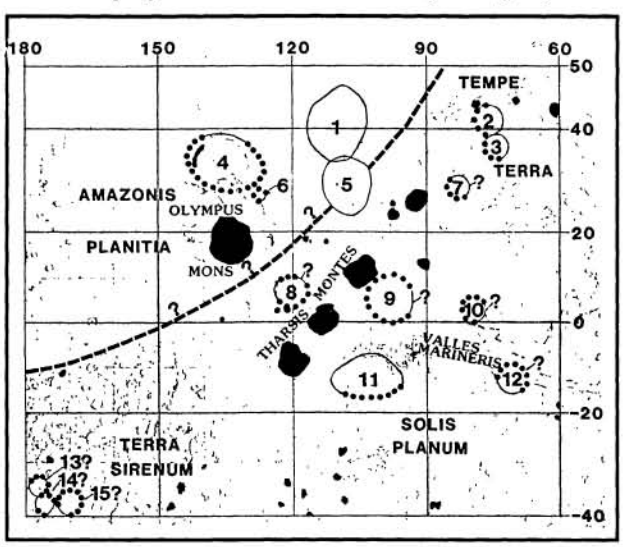

Figure 1: Sketch map of Tharsis region showing distribution of proposed coronae (open circles; solid where exposed, dotted where buried or destroyed, queried where uncertain). Also shown are volcanoes (solid areas) and highland/lowland boundary (dashed line).

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