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CORONAE ON VENUS: OBSERVATIONS AND MODELS OF ORIGIN; E.R. Stofan, Dept. Geological Sciences, Brown University, Providence RI 02912

The Venera 15/16 spacecraft revealed a number of features of unknown origin including *coronae*, elongate to circular structures with a complex interior surrounded by an annulus of concentric ridges (1) (Figure 1). Eighteen coronae have been identified in Venera 15/16 data of Venus (2); an additional thirteen possible coronae are found in Pioneer Venus and Arecibo data (3). Coronae, with maximum widths of 160 to over 650 km, are found primarily in two clusters in the northern hemisphere located to the east and west of Ishtar Terra. Another possible cluster is located in Themis Regio in the southern hemisphere. The majority of coronae are at least partially raised less than 1.5 km above the surrounding region, and over half are partially surrounded by a peripheral trough (2, 4).

Coronae are characterized by an annulus of concentric ridges, composing 15-60% of the radius of a corona (2). Ridges within the annulus are spaced 5-10 km apart, and vary in length from 10-100's of kilometers. The majority of ridges within the annulus are interpreted to be compressional in origin (2, 5). The interiors of coronae are cut by lineaments of compressional, extensional and unknown origin. Volcanic flows, domes and edifices are found in the interior; flows also frequently overlap the annulus and pond in the peripheral trough. The distribution and variety of volcanic landforms indicates that volcanism associated with coronae is not concentrated at a few large edifices or shields as it is major domal uplifts such as Beta Regio (6).

A sequence of events for coronae has been determined through mapping (2, 5). Prior to corona formation, regional compression or extension creates bands of lineaments along which coronae tend to later form (2). During the early stages of corona formation, relatively raised topography is produced by uplift and volcanic construction. The interiors of coronae are characterized by central extensional deformational features and volcanic features that formed in the middle- to late- stages of evolution. In the final stages of corona evolution, volcanism continues accompanied by lowering of topographic relief. Some coronae are cut by later regional tectonic activity. Many of the coronae with the most subdued relief, interpreted to be older, are located at lower (below 40°N) latitudes.

The evolution of coronae and their general characteristics have been compared to two models of corona origin: hotspots and sinking mantle diapirs (7) (Figure 2). In the hotspot or rising mantle diapir model, heating and melting at depth create uplift at the surface. Uplift is accompanied by central extension, facilitating volcanism. Gravitational relaxation of the uplifted region follows producing the compressional features within the annulus and the peripheral trough. Sinking mantle diapirs may form as a result of a phase transformation at depth (such as the basalt/eclogite transition) or cooling of the lithosphere, resulting in denser material detaching from the base of the lithosphere and sinking. Early-time compression is predicted, followed by uplift, central extension and peripheral compression, and formation of a peripheral trough. Both models can predict the major characteristics and evolutionary sequence of coronae. The sinking diapir model does predict an early-time low and central compression as well as broadening and shallowing of the peripheral trough with time, all of which are not observed at current data resolution. In addition, the sinking mantle diapir model predicts more simultaneous formation of the high topography, annulus and trough unlike the hotspot or rising mantle diapir model. High resolution Magellan data will be used to distinguish between the two models of corona origin.

References 1) V.L. Barsukov *et al.*, *JGR*, **91**, 378, 1986. 2) A.A. Pronin and E.R. Stofan, in prep., 1989. 3) E.R. Stofan and J.W. Head, in prep., 1989. 4) E.R. Stofan and J. W. Head, *LPSC XVIII, Suppl.*, 1033. 5) E.R. Stofan and J.W. Head, in review, *Icarus*, 1989. 6) E.R. Stofan *et al.*, *GSA Bull.*, **101**, 143, 1989. 7) E.R. Stofan *et al.*, in prep., 1989.

Figure 1. Venera 15/16 image of Anahit Corona. Anahit is centered at77N, 278, and is about 430 km across. Figure 2. Diagrams of hotspot or rising mantle diapir and sinking mantle diapir models of corona origin.

Figure 1.

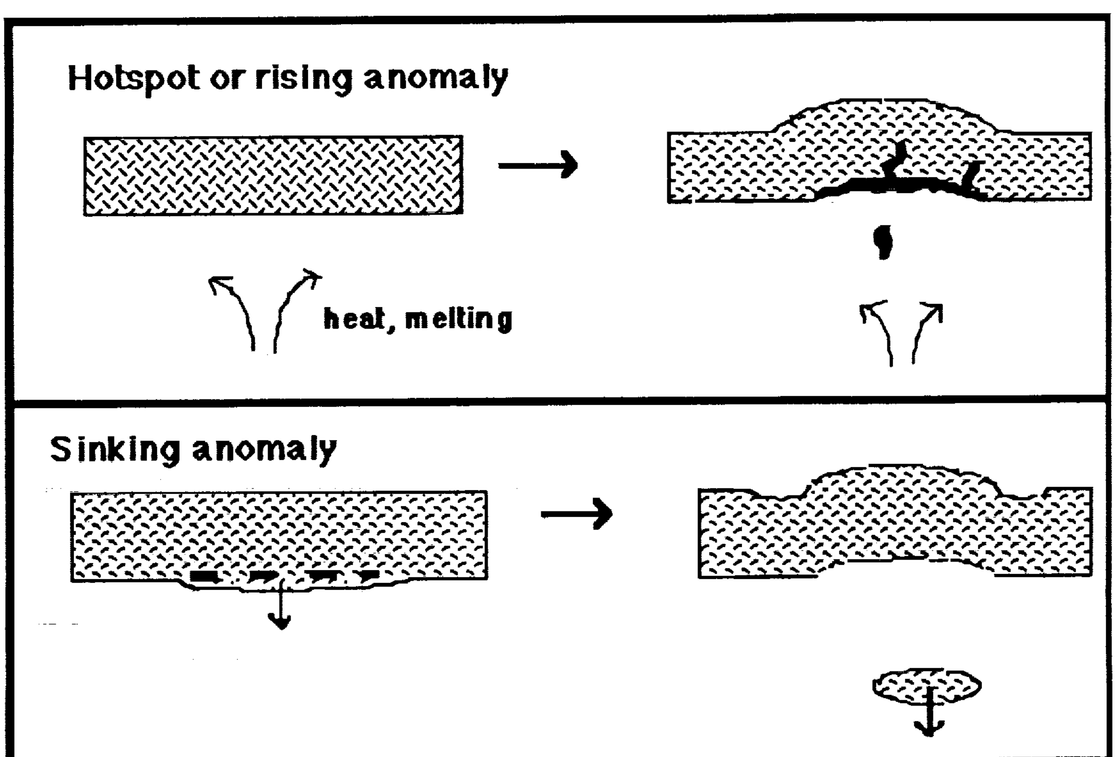

Figure 2