BETA-EISILA DEFORMATION ZONE:ANALYSIS FROM RECENT ARECIBO IMAGES, E.R. Stofan[1], J.W. Head[2] and D.B. Campbell[3], [1]Jet Propulsion Laboratory, Pasadena, CA 91109; [2]Dept. Geol. Sci., Brown Univ., Providence, RI 02912; [3]Natl. Astronomy and Ionosphere Center, Cornell Univ., Ithaca, NY 14853

The Equatorial Highlands on Venus (1) are regions of uplift, volcanism and extension (2). Regional studies have been done to understand the origin and evolution of specific regions within the Equatorial Highlands (3-5), but the relationship between regions within the Equatorial Highlands is not clearly understood (2). The only major topographic gap or lowland region separating the Equatorial Highlands is Guinevere Planitia between Beta and Eisila Regiones. Recently obtained high resolution Arecibo radar data (6) show a zone of deformation continuing from Beta Regio to Eisila Regio through Guinevere, indicating that the Equatorial Highlands-Deformation Zone is globally continuous. We describe the nature of the Beta-Eisila Deformation Zone, and discuss several models for its origin.

The Beta-Eisila Deformation Zone is characterized by ring structures interconnected by radar-bright belts of ridges (Fig. 1). The ring structures are defined by one or more narrow (10-20 km) radar-bright rings with at least 60% of the ring structure identifiable. Diameters of the features range from 80-240 km, with the generally radar-dark interiors of the features characterized by a central bright spot or spots. The ring structures always lie along the belts of ridges and tend to occur at the termination or junction of belts. Ridges both cut and terminate at the ring structures. The zone of deformation cuts across the low topography of Guinevere Planitia into relatively raised topography extending north-west from Eisila Regio. Many of the ring structures correspond to isolated points of relatively raised topography in Guinevere. The center to center distances for a chain of nineteen ring structures extending for over 5000 km were measured. The distance between rings ranged from 280-490 km, with a mean distance of approximately 350 km between ring structures.

In comparison to other circular features on Venus, the ring structures are smaller and have less complex interiors than coronae. They occur in chains unlike coronae and are more closely associated with belts of tectonic lineaments. The features appear to lack the complex network of lineaments associated with arachnoids, but are similar in size and general morphology. No obvious flow features can be identified associated with ring structures, unlike similar size volcanoes. The ring structures are similar in appearance to a group of circular structures in Themis Regio (7, 8). The main chain of circular features in Themis are spaced slightly farther apart (406 vs. 350 km) than the ring structures (8). The ring structures are also similar to circular structures along ridge belts in the Atalanta region, which may form by diapirism (9). The origin of the ring structures is closely linked to the origin of the belts of radar-bright lineaments along which they occur. If the belts are of compressional origin (10, 11), the ring structures may result from sinking instabilities produced by thickened or cooled crustal material (Fig. 2). Or, ring structures may form by rising diapirs in an extensional environment (Fig. 2).

Instabilities due to density changes through melting in the mantle beneath spreading ridges produces upwelling at regular intervals along the boundary between two spreading plates (12). The spacing is a function of the geometry as well as the viscosity contrast between the melt and its surroundings; a thin layer of low viscosity fluid would produce widely spaced diapirs (12, 13). Spacings of features along the MAR and EPR have been related to spreading rate and viscosity contrasts (13). If the ring structures are being produced in a crustal spreading environment, processes inferred to be taking place in Aphrodite (4) may extend further to the west in the Equatorial Highlands. The nature of the Beta-Eisila Deformation Zone and models for its origin are being further studied, as well as its relation to the origin and evolution of the Equatorial Highlands.

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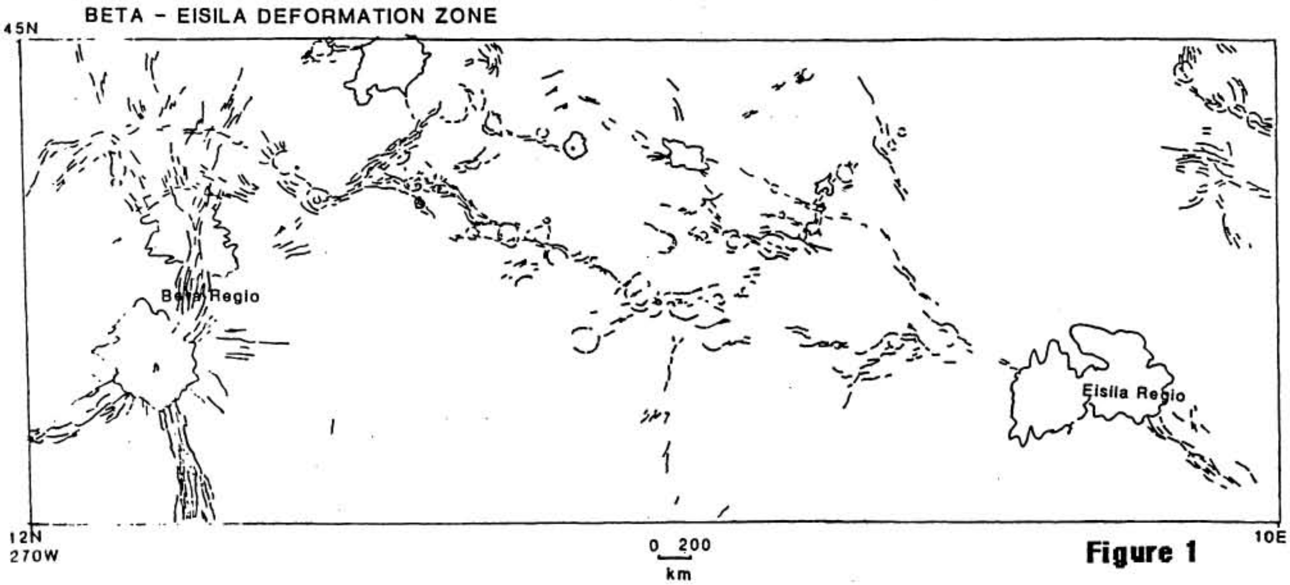

Figure 1

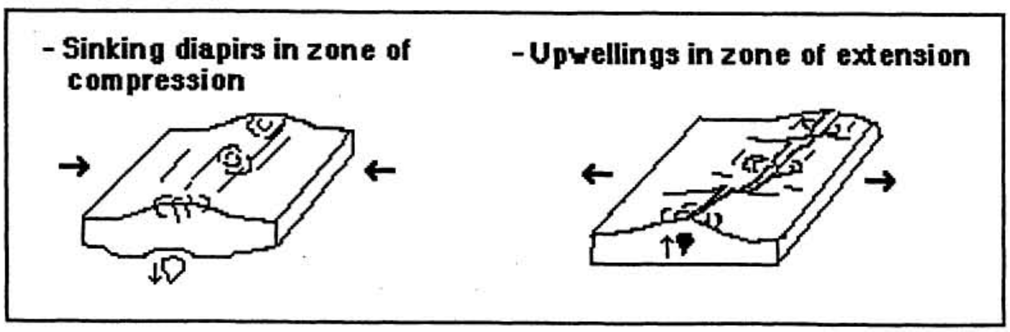

Figure 2