TESTS FOR PLATE SPREADING IN EISTLA REGIO, VENUS; Philip J. Stooke, Department of Geography, University of Western Ontario, London, Ontario N6A 5C2 (bitnet: STOOKE@VAXR.SSCL.UWO.CA).

INTRODUCTION: Lithospheric spreading on Venus has been proposed to explain topographic similarities between Aphrodite Terra and terrestrial mid-ocean ridges (1,2,3). No global pattern of plates is yet apparent, though a general scheme (equatorial spreading, polar convergence) has been proposed (4) and may be supported by crater counts (5). Local plate patterns have also been suggested (6,7). This study extends the analysis to Eistla Regio (the earlier spelling Eisila is incorrect, ref. 8), an area covered by Earth-based radar images. Two tests for the spreading hypothesis were devised. First, a pattern of bilateral symmetry was sought. Second, images and geologic maps of the region centred on Eistla were examined for evidence of that pattern. Data for the study were USGS maps I-1324 and I-2041, Venera 15/16 images and maps (9,10), Goldstone images (11,12,13; prints courtesy R. Goldstein, R. Jurgens) and maps (14) and Arecibo images (5,15,16).

TOPOGRAPHIC SYMMETRY: Cross-Strike Discontinuities (CSDs) from (1,2,3) were plotted on USGS map I-1562. Parallel discontinuities separating bilaterally symmetrical zones were found to the west (Figure 1), guided particularly by the en echelon form of Eistla (which echoes that of Ovda and Thetis Regiones). The pattern dies out west of Eistla. This is not proof of spreading, but the similarity of form is such that spreading must be considered as likely in Eistla as in Aphrodite. The degree of symmetry is illustrated in Figure 2. However, the significance of this observation should not be exaggerated. A less convincing but still viable pattern of CSDs and symmetry was found in the same area, with axes of symmetry at an azimuth of 120° along the crest of Eistla and CSDs striking NNE to SSW. In any area of complex relief it may be possible to find some pattern of approximate symmetry, particularly if arbitrarily spaced discontinuities are permitted. The alternate scheme is not proposed here, but evidence of it was sought in radar images and it is invoked to challenge the uniqueness of Figure 1, and by implication that of refs. 1,2,3 and the reality of spreading itself.

GEOLOGIC MAPPING: Several geologic maps and radar images of the Eistla region were combined as consistently as possible (Figure 3). The map of Goldstone data (14) was revised to incorporate 1978 and more recent images (e.g. 13). The Venera maps (9,10) were simplified and units assigned to the classes of (14). Recent Arecibo images (e.g. 5,16) were used to extend coverage. A few features were plotted from lower resolution Arecibo images (15). Units are: Hilly Terrain interpreted as tesserae; Rough Plains interpreted as volcanic deposits and constructs, partly mantled with sediment and faulted in places; Smooth Plains interpreted as volcanic deposits and sediment; Smooth Uplands (Beta and Bell) interpreted as lava-mantled tectonic uplifts. Also mapped are coronae, ridges, graben and the Danu Montes. The CSDs and axes of symmetry of Figure 1 and the alternate scheme were superimposed (only the former is shown in Figure 3) and evidence for them was sought in the map and its sources. Results were largely negative. A few tesserae have symmetrically placed counterparts (e.g. Alpha and Moira, Manzan-Gurme and blocks near Tinatin Planitia) and might conceivably be interpreted as separated fragments of originally intact blocks. Several postulated CSDs cross Goldstone images and all extend into Venera coverage but few correspond to topographic features. The Zorile Dorsa are positioned on a CSD and Tomem Dorsa are parallel to flanking CSDs, but Bezlea Dorsa cut across a CSD. The axis of symmetry of the alternate scheme corresponds to en echelon lineaments west of Sif Mons (5). Otherwise, many CSDs and those few axes of symmetry which should be seen are not. Geologic mapping offers little support to the spreading hypothesis.

DISCUSSION: The above results are inconclusive. Several interpretations are possible: (i) Most features (especially distal ends of CSDs) associated with spreading are buried by volcanic deposits; (ii) Landforms are unlike those of our ocean floors and go unrecognised; (iii) Existing images are merely inadequate, in which case Magellan data may resolve the issue; (iv) Spreading is happening but not in the patterns of Figure 1 and the alternate described above; (v) Spreading has not occurred in Eistla (and probably not in Aphrodite). The case for spreading in general should probably be regarded as weakened.

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Figure 1. Possible Spreading Pattern in Eistla Regio.

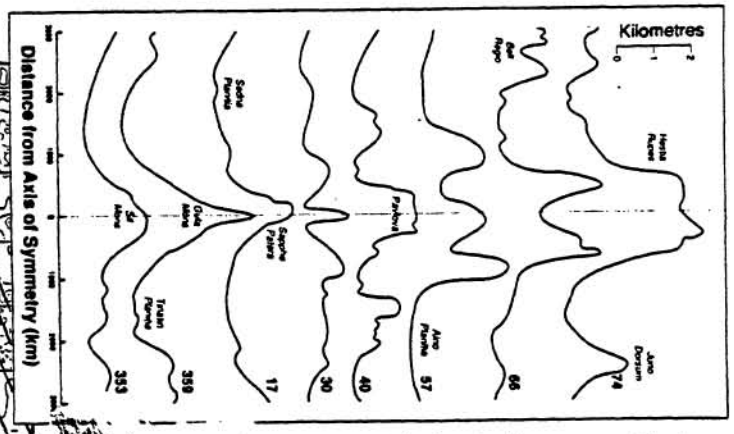

Figure 2. Profiles across Eistla Regio, perpendicular to symmetry axis at longitudes indicated at bottom).

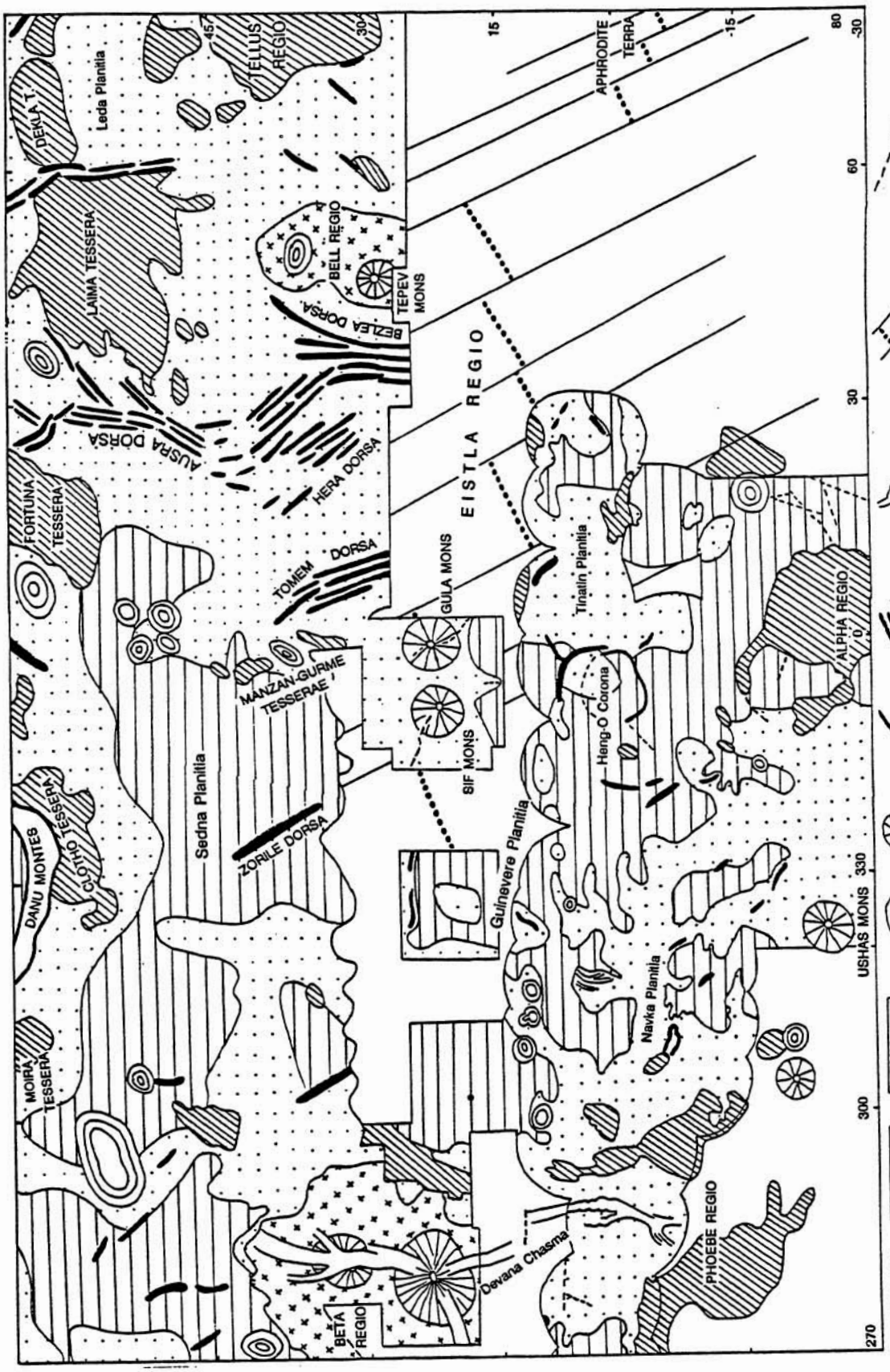

Figure 3. Geologic map of Eistla Regio and Surroundings, Showing Relationship Between Postulated Spreading Features and Mapped Units.