SUBDUCTION ON THE MARGINS OF CORONAE ON VENUS: EVIDENCE FROM RADIOTHERMAL EMISSIVITY MEASUREMENTS.

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Retrograde subduction has been suggested to occur at three coronae on Venus: Latona, Artemis and Eithinoha [1]. Using the mineralogical arguments of [2] to explain surface emissivity, a study of radiothermal emissivity of Venus coronae [3] has shown that emissivity changes associated with Latona, Artemis and Ceres imply the same crustal movements predicted by the subduction model of [1].

Emissivity (e) varies with altitude (a) on Venus: at low altitudes e is nearly constant at ~0.85, then at an altitude around 6055-km planetary radius (the critical altitude (c.a.) [2]) e decreases abruptly to values as low as ~0.35. One explanation for this first-order a/e trend is that weathered material at high altitudes has a greater dielectric constant (~20) than that at low altitudes (5-10) owing to a higher proportion of electrically conductive minerals within the dry host rock (~7% at high altitudes compared with ~3% at low altitudes) [2,4]. Deviations from this first-order trend can be simply explained by the absence of weathered material at high altitudes in some settings, owing to volcanic or tectonic activity that has occurred so recently that weathering has not had time to create the low-e mineralogy [5,6]; instances of this can be detected by constructing a/e scatter plots (e.g. Fig. 1).

At Latona the features of the a/e plot (Fig. 1) crucial to this discussion are the points within the areas labelled A, B and C. The points which make up area A come from measurements in the inner wall of the N and NW rim of Latona, and the two intermediate-altitude low-e regions come from measurements that embrace the inner SE rim (B) and the trench outboard of the rim (C; Figs. 2 and 3). Assuming the anomalous low-e material was produced at higher altitudes where its mineralogy is stable [2], then its presence at low altitudes now can be explained by recent tectonic movement of crustal material downwards and in a southeasterly direction. These activities must have taken place at a rate faster than that of weathering in order to retain the anomalous emissivity signatures, and so may be continuing to the present day. This interpretation of tectonic activity at Latona is the same as that predicted by the subduction model of [1] which proposes that subduction may be occurring along the margins of the SE sector of Latona. [1] also suggest that extension should take place in the corona interior in order to accommodate the subduction; such extension could explain the downward movement of the low-e material at the inner N and NW rim by tensional tectonics.

At Artemis an important second-order deviation from the first-order a/e trend is that e decreases by only 10% along the NE rim compared with the 30-50% decrease usually observed above the c.a.; the NE rim of Artemis reaches 6057.9 km which is 2.9 km higher then the average c.a. recorded by [2]. This suggests that formation of weathered material is incomplete over this part of the rim which would indicate that it has been uplifted recently at a rate comparable to that of weathering. Uplift of the rim is expected in the subduction model for Artemis of [1], owing to compressive forces that result from subduction into the trench outboard of the rim.

Ceres was not included in the study of [1], but results from the study of [3] indicate it has experienced tectonic movements similar in nature to those at Latona. At the NNW rim the first-order a/e trend is observed since low-e material is found at high altitudes, but on the SSE rim deviations from the first-order trend are observed: low-e material is found in the low-altitude trench outboard of the rim, and high-e material is found at high altitudes. Assuming the low-e material originally formed at high altitudes, this observation can be explained by recent tectonic movements of crustal material downwards and in a southeasterly direction, possibly by subductive forces similar to those described for Latona. On the other hand [1] suggested that subduction might have occurred at Eithinoha, but there is no evidence in the emissivity dataset to support this. However, this cannot be taken to exclude tectonic activity at Eithinoha. Eithinoha reaches a maximum altitude of 6053.6 km, and therefore if tectonism has taken place it probably would have done so entirely beneath the c.a. and so would not leave evidence in the emissivity dataset in the form of weathered material.

References: 1. Sandwell, D.T., and G. Schubert (1992) *Science* 257, 766. 2. Klose, K.B. et al. (1992) *J. Geophys. Res.* 97, 16353. 3. Robinson, C.A., and J.A. Wood (1993) in preparation. 4. Pettengill, G.H. et al. (1982) *Science* 217, 640. 5. Robinson, C.A., and J.A. Wood (1992) *Icarus*, submitted. 6. Pathare, A. (1992) B.S. thesis, Harvard University.

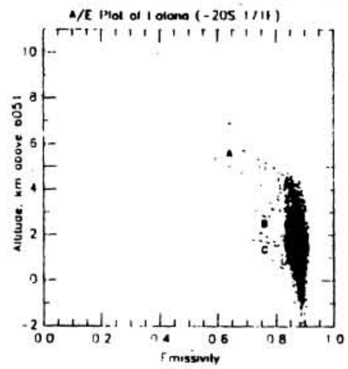

Figure 1. A/e plot of Latona. A: these points come from measurements of the inner N and NW rim. B: these points come from measurements of the SE rim. C: these points come from measurements of the trench outboard of the SE rim.

Figure 2. SAR image of Latona taken from C1MIDRs 15S163 and 30S171 (D:-16^{o}S, 167.5^{o}E; E: -25.5^{o}S, 175^{o}E), showing the location of the NW rim (A), the SE rim (B) and the trench outboard of the SE rim (C). North is to the top of the photograph. Latona measures ~600 km from east to west.

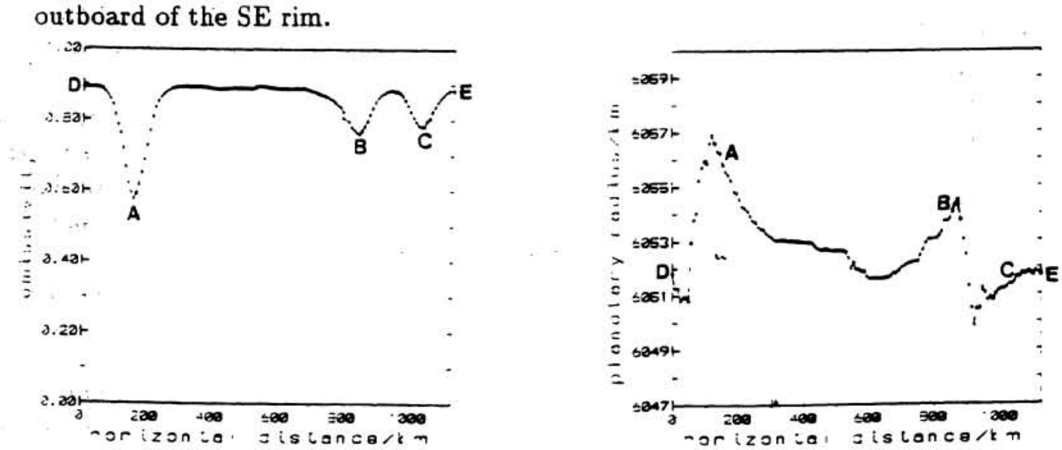

Figure 3. Altimetry and emissivity profiles across Latona (D: -16^{o}S, 167.5^{o}E; E: -25.5^{o}S, 175^{o}E). A: NW rim. B: the SE rim. C: the trench outboard of the SE rim. A, B and C correspond to traverses through the 3 anomalous fields labelled in Fig. 1.