ANALYSIS OF GRAVITY AND TOPOGRAPHY SIGNALS IN ATALANTA-VINMARA AND LAVINIA PLANITIAE. P.J. Dennedy-Frank[1] and M. Simons, Seismological Laboratory, California Institute of Technology, Pasadena CA 91125, USA (pjdf@mit.edu) [1]Now at Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge MA 02139, USA

Ridge and fracture belts are the dominant tectonic features in portions of Lavinia and Atalanta-Vinmara Planitiae on Venus. These features are 100s to 1000s of km long and consist of two wavelengths of deformation in width, with groups of wrinkle ridges or fractures and faults on the order of 1-10 km making up topographic rises on the order of 200-300 km wide [1]. The origin of these features is enigmatic. Previous work suggests that structures with two wavelengths of deformation can be formed by instability growth in a compressive system with a strong upper crust and mantle separated by a weak lower crust [2], resulting in an in-phase folding of the primary layers. This in-phase folding makes specific predictions about the relationship between gravity and topography in this region. Our work looks at the gravity and topography signals made available by recent reprocessing of the available data, and implies that they are not consistent with a folding-deformed lithosphere. We suggest instead that the larger scale deformation may be due to a series of thrust faults formed in a compressive regime.

We use the 1999 reanalyses of altimetric data for topography [3] and Doppler line-of-sight tracks for gravity [4]. We believe these give us good resolution out to degree-and-order 120, permitting us to begin to resolve the ridge and fracture belts in the gravity data. In the Bouguer gravity field, the positive-topography belts tend to have negative anomalies. These negative anomalies suggest that the belts are underlain by low-density material. This density profile is not consistent with in-phase folding, where high-density mantle lies beneath high topography, although later faulting and crustal thickening might change the initial in-phase fold structure. In addition, we use a spectro-spatial localization method [5] to perform admittance studies in these areas. We find an effective elastic thickness of 10-30 km and a crustal thickness of 20-40 km, with a preferred value of 10 and 20 km respectively. These estimates of effective elastic and crustal thickness are consistent with previous studies [5].

With the inferred crustal root beneath high-topography deformation belts, as well as crustal and effective elastic thicknesses, we can begin to understand the formation mechanism of these features. We suggest, based mainly on their low-density roots, that they consist of a series of thrust faults formed in a compressional regime. They could also be extensional pinch-and-swell features; however, most work suggests that these plains are sites of large-scale downwellings and thus compressive stresses [5,6]. A particularly interesting question is whether ridge and fracture belts form via the same mechanism. This would seem to be true in Atalanta-Vinmara, where the belts form a roughly parallel anastamozing pattern. In Lavinia, however, the belts are oblique, suggesting that they are formed via different processes. Work examining these structures on a more local scale is ongoing.

References [1] Solomon, S.C. *et al.* (1992) *JGR, 97,* 13,199-13,255. [2] Zuber, M. (1987) *LPS XVII., 92, Part 2,* E541-E551. [3] Rappapport, N.J. *et al.* (1999) *Icarus, 139*, 19-31. [4] Konopliv, A.S. (1999) *Icarus, 139*, 3-18. [5] Simons, M. *et al.* (1997) *GJI, 131,* 24-44. [6] Squyres, S. *et al.* (1992) *JGR, 97,* 13,579-13,599.

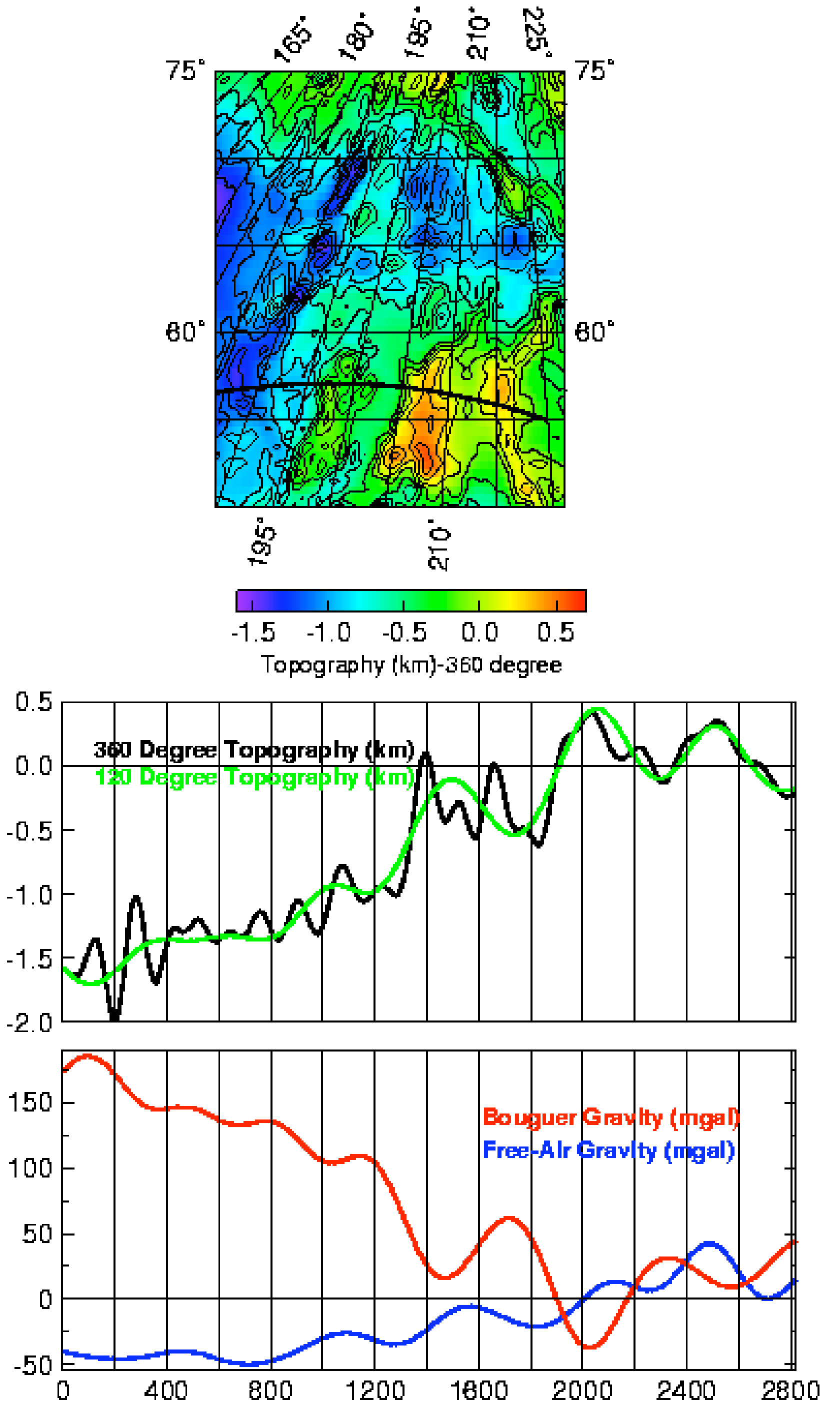

Figure 1: Topographic profile across deformation belts in Atalanta-Vinmara Planitiae. The topographic map is shown using a sinusoidal projection centered at 215°E. The profile runs from 55°N, 180°E to 55°N, 220°E and is a segment of a great circle. The horizontal scale in the profile is in kilometers from the start of the profile.