CONSTRAINTS ON DEFORMATION BELT EVOLUTION ON VENUS. D. A. Young, *University of Minnesota-Duluth, Duluth MN 55812, USA, (dyoung1@d.umn.edu).*

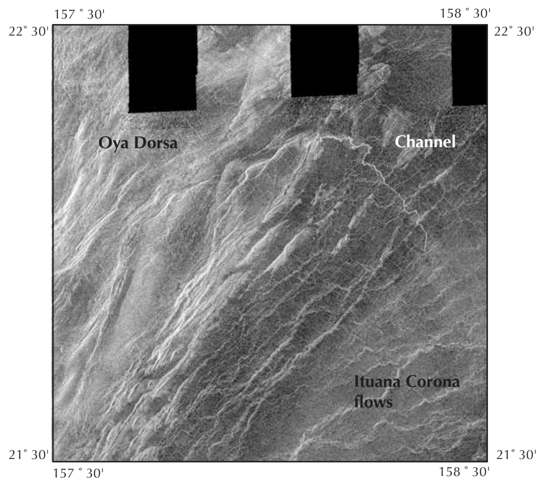

Figure 1: Oya Dorsa. The image is approximately 105 km across. The channel is aligned with the local downslope direction, postdating the arching of the belt. Ituana Corona flows also appear to 'recognize' the slope. Meanwhile, the deformed surface of the belt appears to be embayed by local dark homogenous material. Wrinkle ridges locally parallel the belt, but regionally are at a high angle

Introduction: Deformation belts are regions of approximally linear deformation found in lowland regions of Venus. They often correlate with planitia, broad topographic lows demonstrated to be dynamically supported. Belts have been hypothesized to represent a response to regional contraction due to large scale mantle convection (1; 2; 3). In the Rusalka Planitia region, the interaction between the belts Oya Dorsa and Polunista Dorsa and regional structures, the presence of evidence for local volcanism, and aspects of the belt deformation suggest an intriguing alternative hypothesis for their formation: local lithospheric delamination.

Methods: Magellan synthetic aperture radar (SAR) imagery was geologically mapped at full resolution (100 meters). Cycle 1 data, illuminated from the west at 45° is available for both mapped belts; additional higer inclination stereo data was also used for Oya Dorsa. The results of this mapping were compared to two sets of derived Magellan altimetry data with resolutions of 10 kilometers. Altimetry derived from calculated Hargfors' templates for echoes is the most commonly used data. An alternative thresholding method attempts to pick the first return. The template-derived data are more precise, but are susceptible to misleading off-axis echoes in areas of rough topography. The thresholding method does not yield 'representative' topography, being biased toward the highest points within an altimetry 'footprint', but for purposes of this study, may be more accurate (4).

Previous Magellan investigations of deformation belts examined the high-latitude Latvina Planitia (3) and Vellamo Planitia (5; 6). This study focus on two belts in the Rusalka Planitia region, lying closer the periapsis of Magellan's orbit (9°N), yeilding higher spatial resolutions, particularly for the altimetry data.

Rusalka Planitia is a complex topographic basin, in scale and profile similar to others on Venus shown to be dynamically supported (7). It is centered at 170° E and 5°N and is approximately 2000 km across. A similar topographic basin, Llorona Planitia, lies to the north west.

Poludnista Dorsa: Poludnista Dorsa, a complex 2000-kilometer long deformation belt in Rusalka Planitia, is segmented by orientation and tectonic style. Much of this belt is made up of topographic arches up to a kilometer high and a couple of hundred kilometers wide, overprinting a structural core of local ridges and lineaments approximately an order of magnitude smaller. The flanks of the arch component typically extending beyond the structural core into surrounding smooth materials, and control some of the regional short-wavelength deformation (wrinkle ridges). As the smooth materials locally embay the structural core (and if they represent a local stratigraphic marker) archs appears to be a late feature of the topography of Poludnista Dorsa. Poludnitsa Dorsa's short-wavelength ridges appear to predate the emplacement of some local volcanic shield material; again, the regional wrinkle ridge trend is oblique to the broad warp orientation. (8; 4)

Locally sourced late stage volcanic flows and shields are prevalent along the ridge belt. Substantial caldera formation is not observed, and even summit pits seem suppressed in some areas. This observation of deformation belt volcanism reinforces the evidence for substantial volcanic activity that has also been described in post-Magellan mapping of the deformation belts of Vinmara Planitia (9; 5; 6). 'Mottled plains' material described in Latvina Planitia belts likely represent shield volcanism (10; 3).

Oya Dorsa: Oya Dorsa shows a deformation belts interaction with expansive corona sourced flows. Assuming the submembers of the flows are emplaced flat, substantial dorsa related arching postdates and predates the flows. Extension within deformation belts has been attributed to bending or slope failure - but here graben trend orthogonal to slopes or lie well off the flanks. There is evidence for ongoing volcanism apparently after the main arch developed; a 50 kilometer long channel emerging from a caldera. The relationship between the channel Jutrzenka Vallis and graben on the outer flanks of Oya Dorsa is more ambiguous.

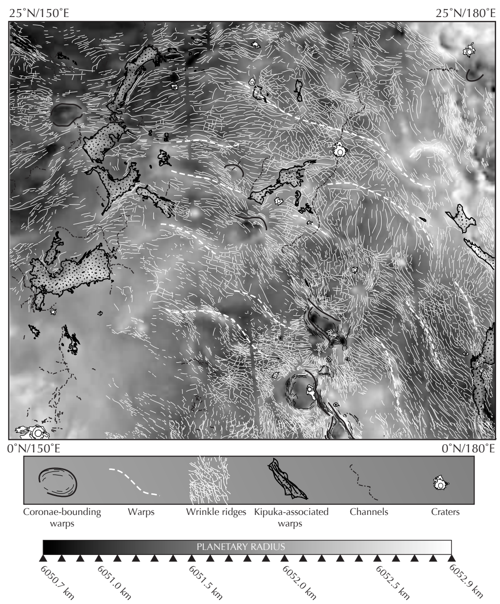

Figure 2: Distribution of wrinkle ridges (fine white lines), 'warps' (thick dashed white lines) and deformations belts (black and hashed) in the Rusalka Region. Oya Dorsa is in the top left, Poludnista along the right edge. From (8)

Regional context: Several warps without distinctive geology also occur in Rusalka Planitia, including Yalyane Dorsa and Vetsorgo Dorsum. These relatively featureless warps parallel regional wrinkle ridges. Warps bow up to a kilometer high with ∼250 kilometer spacing. They are similar in amplitude to the deformation belts, but lack the closely packed ridges and folds. Although there is clear evidence that the warping began before the surface manifestation of the wrinkle ridges was imposed (11), the initiation of the underlying wrinkle ridge suite is harder to date.

Conclusions: Evidence for coeval local volcanism, superposed contraction and extensional faulting, abrupt segmentation may indicate a role for out-of-plane forces (for example, delamination, detachment or crustal overthickening and collapse) in the structural core of the belt. Regional wrinkle ridge patterns, and interactions with 'warps' strongly suggest that arching of the deformation belts is a result of reactivation of a localized feature, rather than a pervasive fabric preserved in kipuka. In terms of proccess, initial belt formation appears not to be directly connected to planitia development. Similar results are found for the simpler belt Oya Dorsa in Llorono Planitia.

Evolution in the scale of deformation and the existence of intertwined volcanism demand an improvement in our models of these enigmatic features.

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