MORPHOLOGY OF WRINKE RIDGES IN THE ALPHA REGIO (V-32) QUADRANGLE, VENUS. E. M. Bethell[1], R. E. Ernst[1,2], and C. Samson[1,3]. [1]Department of Earth Sciences, Carleton University, 1125 Colonel By Dr, Ottawa, ON, Canada, K1S 5B6; erinbethell@cmail.carleton.ca, [2]Faculty of Geology and Geography, Tomsk State University, Lenin Ave, 36, Tomsk, Tomskaya Oblast', Russia, 634050 [3]Department of Construction Engineering, École de Technologie Supérieure, 1100 Notre-Dame St W, Montréal, QC, Canada, H3C 1K3.

Introduction: Wrinkle ridges are common surface features on the terrestrial bodies of our solar system. They are typically sinuous along strike, have positive topography, and are inferred to be contractional in origin [1]. A thrust fault and anticline origin for wrinkle ridges has commonly been proposed [e.g. 2, 3, 4].

The morphology of wrinkle ridges on Venus is not well understood. This is largely a result of the low resolution of the altimetry data provided by the Magellan mission. The altimetry data have footprint sizes of approximately 10-20 km, which is relatively large compared to the size of individual wrinkle ridges. Improved resolution has been provided by a recently developed stereo-derived topography dataset that has a horizontal resolution of ~1-2 km and a vertical resolution of ~50-100 m [5].

A 1:2.5 million scale geological map of the Alpha Regio (V-32) quadrangle has recently been completed [6]. Among the mapped structural features, a regional system of ENE-WSW trending wrinkle ridges was identified. We present preliminary observations on the morphology of these wrinkle ridges, obtained from analysis of 225 stereo-derived topography profiles across 20 wrinkle ridges.

Methods: The structural mapping of wrinkle ridges produced by [6] was used to inform the construction of topographic profiles; profiles were only constructed along mapped wrinkle ridges. Multiple profiles were created for each wrinkle ridge, with an approximate spacing of 5 km between each profile line. Profile lines were constructed perpendicular to the local strike of the wrinkle ridge.

Results: We report average measurements on the morphology of individual wrinkle ridges and of the whole population.

Width. Average widths for each wrinkle ridge range from 7.0 ± 1.2 km to 13.5 ± 1.9 km. The average width of all wrinkle ridges is 8.9 ± 1.9 km.

Height. Average heights for individual wrinkle ridges give minimum values of 68.4 ± 33.8 m and maximum values of 178.4 ± 62.6 m, with an average height for all wrinkle ridges of 116.3 ± 29.1 m.

Estimates of Shortening and Strain. Estimates of shortening due to folding represent the difference between the initial length of the profile (i.e. the surface length) and the length of the profile in its deformed state (i.e. the straight-line length), after [3]. Shortening estimates have been converted into percentages of strain using a ratio of shortening to initial length. Average shortening estimates for each wrinkle ridge range between 1.45 ± 1.40 m or 0.02 ± 0.02%, to 12.26 ± 10.91 m or 0.18 ± 0.18%. The average shortening for all wrinkle ridges is 4.86 ± 2.9 m or 0.06 ± 0.04%.

Discussion and Conclusions: Analysis of topographic profiles across wrinkle ridges has yielded an average ridge width of 8.9 km and an average ridge height of 116 m. Calculations of shortening due to folding indicate that the average wrinkle ridge has accommodated 4.9 m of shortening, representing a strain of 0.06%. The wrinkle ridges studied here have an average aspect ratio of 60:1, representing broad, low-amplitude features.

The shortening values calculated here are much smaller than previous estimates for Venusian wrinkle ridges (1-5%; obtained from structural models and analysis of radar imagery) [7] and for wrinkle ridges on other bodies [e.g. 3,8]. It should be noted that the estimates of shortening presented here represent only the component of shortening resulting from folding at the surface. Following the methodology of [3], a component of shortening is also produced by faulting at depth and can be calculated using the elevation offset across the ridge. We have not yet been able to quantify elevation offsets across wrinkle ridges, and therefore the shortening due to faulting, due to complex regional topographic gradients in this region. Notwithstanding, the low values obtained for shortening due to folding suggest that thrust faulting may play a more significant role in the formation of these wrinkle ridges. Future work will focus on the analysis of potential regional trends in wrinkle ridge dimensions, spacing, and shortening. We will also attempt to use a variety of more complex structural models to evaluate the total shortening associated with wrinkle ridges.

References: [1ll] McGill, G.E. (1993) *Geophys. Res. Lett ers, 20*, 2407-2410. [2] Watters, T.R. (1988) *JGR: Solid Earth, 93*, 10236-10254. [3] Golombek, M.P., et al. (1991) Proc. of Lunar and Planet Sci., 21, 679-693. [4] Okubo, C.H., and Schultz, R.A. (2004) *GSA Bulletin, 116*, 594-605. [5] Herrick, R.R., et al. (2012) Eos, 93, 125-126. [6] Bethell, E.M., et al. (2019) *Journal of Maps, 15*, 474-486. [7] Bilotti, F.D. (1997) *PhD thesis, Princeton University*. [8] Plescia, J.B. (1991) *Geophys. Res. Letters, 8*, 913-916.