GEOLOGICAL SIGNIFICANCE OF LAYERING IN VENUS TESSERA UNITS. Paul K. Byrne[1], Richard C. Ghail[2], Martha S. Gilmore[3], A. M. Celâl Şengör[4], Christian Klimczak[5], Sean C. Solomon[6], Sara Khawja[7], and Richard E. Ernst[7,8], [1]Planetary Research Group, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University, Raleigh, NC 27695, USA (paul.byrne@ncsu.edu); [2]Department of Earth Sciences, Royal Holloway, University of London, Egham, TW20 0EX, UK; [3]Department of Earth and Environmental Sciences, Wesleyan University, Middletown, CT 06459, USA; [4]Department of Geology, Faculty of Mines and the Eurasia Institute of Earth Sciences, Istanbul Technical University, 34469 Ayazaga, İstanbul, Turkey; [5]Department of Geology, University of Georgia, Athens, GA 30602, USA; [6]Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY 10964, USA; [7]Department of Earth Sciences, Carleton University, Ottawa, ON K1S 5B6, Canada; [8]Faculty of Geology and Geography, Tomsk State University, Tomsk, 634050, Russia.

Introduction. Tessera units occupy ~7% of the surface of Venus [1] and are characterized by pervasive tectonic deformation. Numerous sets of lineaments, interpreted as mixes of extensional and shortening structures, record complex strain histories for individual tessera exposures [e.g., 2–4]. On the basis of gravity anomaly, morphology, and inferred composition, it has been proposed that tesserae are the Venus counterparts to continents on Earth [5–7]; indeed, surface emissivity data from the ESA Venus Express mission provide supporting evidence that the Alpha Regio tessera is more felsic than adjacent basaltic plains [8]. A better understanding of Venus' tessera units is therefore key to determining if, for example, these units formed in the presence of abundant volumes of water [9].

Interior Layering. In Alpha Regio, in addition to the recognized extensional and shortening structures, a set of (often highly) curved, parallel lineaments is present. These structures strongly resemble tilted strata in layered sequences on Earth that have an arcuate or sinuous outcrop pattern because of erosion. The irregular curvilinear patterns of these lineaments in tesserae may thus be indicative of layers that follow undulating topography with ~10-km length scales (**Figure 1**, as well as examples at e.g., 24°S, 5°E, and 22°S, 6°E). These candidate strata are ~50–200 m thick, although fainter lineaments that parallel the more prominent examples suggest some thinner layers, perhaps <10 m thick, as well.

Interpretation. The nature of these strata is unclear, although by analogy with Earth they could be stacked lava flows (i.e., trap terrain) or sedimentary units. The map patterns in Alpha Regio are consistent with gently dipping layers; however, even for conformal strata with a dip angle of 1°, their presence across the breadth of this region (~1,900 km) indicates a stratigraphic sequence as much as 33 km thick, with commensurately substantial erosion. Alternatively, these strata may represent periclinal folds with dip angles of 20° or greater, similar to those that comprise the Zagros fold-and-thrust belt on Earth [e.g., 10]. Dipping fold limbs do not require such a great stratigraphic thickness or extent of erosion. Yet whether these lineaments are folded or gently dipping, planar layers, their curved outcrop patterns implies some erosion throughout Alpha Regio; the radar-dark materials filling local lows may be deposits of that eroded material. This outcrop pattern is also seen in Tellus Tessera (39°N, 80°E) [11,12] and Manatum Tessera (8°S, 67°E), as well as in Ovda (3°S, 86°E) and Thetis (11°S, 130°E) regiones.

Outlook. Given the widespread occurrence of apparent layering in these units, the preservation of interior strata may characterize Venus tesserae in general. If so, the presence of such layering challenges inferences that this enigmatic unit represents uneroded, fractured crystalline rocks, and requires instead a more complex history of volcanic and/or sedimentary deposition, deformation, and exhumation.

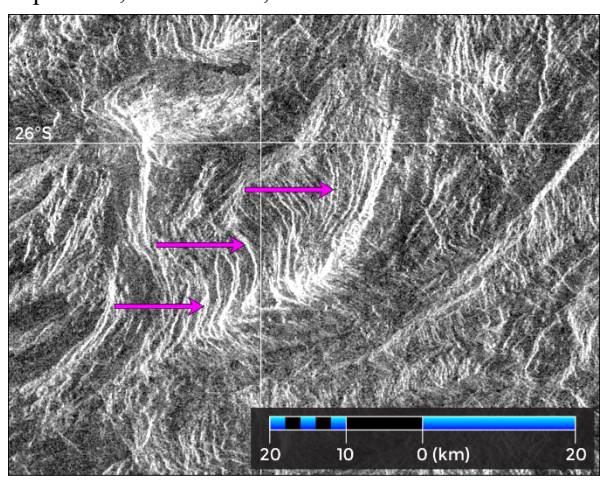

Figure 1. *Examples of arcuate structures in Alpha Regio tessera (marked by pink arrows). Radar image in azimuthal equidistant projection, centered at 26°S, 1°E; look direction is from the left.*

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