

IS THERE A GENETIC ASSOCIATION BETWEEN RIBBON TESSERA TERRAIN AND SHIELD TERRAIN, VENUS? V. L. Hansen¹, ¹Department of Geological Sciences, 1114 Kirby Drive, University of Minnesota Duluth, Duluth, MN 55812 (vhansen@d.umn.edu).

Introduction: Venus host two distinctive terrains, one tectonic, the other volcanic. These two terrain types, ribbon tessera terrain and shield terrain are both extensively preserved across the surface of Venus, and they might also show a spatial correlation, which may, in turn reflect a genetic relationship.

Geology: Ribbon tessera terrain (rtt) represents the oldest locally exposed unit across Venus' surface. Unit rtt—variably marked by multiple wavelength contractional (folds), extensional (ribbons), and S-C-like shear structures—characterizes crustal plateaus (2-3 million km² quasi-circular highlands) and is preserved in large and small kipukas in the lowland (Hansen & Willis 1998; Ivanov & Head 1996). Detailed global geologic mapping indicates that rtt covers ~12% of the surface (Hansen et al. 2007; Hansen & Lopez 2008; unpublished mapping). Isopach calculations indicates that rtt lies at <1km deep across at least 48.5% of the surface.

Shield terrain, first recognized by Aubele (1996), comprises a volcanic terrain comprises of shield edifices (Guest et al. 1992) and shield paint, a low viscosity flow material (Hansen 2005). Shield terrain, in contrast with shield fields (Crumpler et al. 1997) occurs across huge regions (millions of square km), significantly greater than the <300 km diameter areas of shield fields. Shield terrain appears to represent *in situ* partial melting at depth and subsequent translation of the melt material to the surface across extensive regions (Hansen 2005). Detailed geologic mapping indicates that shields and associated flow material (shield paint) form time-transgressively relative to fracture formation and local contraction, as evidenced by the formation of inversion structures involving shield materials and existing fractures. The formation of shield terrain remains a mystery.

Geologic mapping of several VMap areas reveals that shield terrain occurs in spatial correlation with rtt within crustal plateaus, as well as with regions that host large to small kipukas of rtt. Examples include (but are not limited to): Meskhert (V-3), Shimti Tessera (V-11), Vellamo Planitia (V-12), Nemesis Tesserae (V-13), Beta Regio (V-17), Niobe (V-23), Greenway (V-24), Agnesi (V-45), Aino Planitia (V-46), Helen Planitia (V-52) (Aubele 1996; Basilevsky 2008; Head and Ivanov 2005, 2008; Hansen 2008; Hansen and Tharalson submitted; Lang and Hansen 2008; Lopez and Hansen 2008; Stofan and Guest 2003; Stofan et al. 2003). There are also a few VMap quadrangles that are notable lacking in both ribbon tessera

terrain and shield terrain, such as Artemis (V-48), and Manuela Tholus (V-49), Barrymore (V-59) (Bannister & Hansen in press; Johnson et al. 1999).

Implications: The results of global mapping—both at the most detailed scale, as well as at the VMap scale by numerous individuals—are consistent with, and perhaps suggestive of, a genetic relationship between ribbon tessera terrain and shield terrain. Detailed mapping indicates that such a suggestion is worth consideration.

Ribbon tessera terrain may represent the surface 'scum' of huge lava ponds that formed on the surface of Venus in the ancient past (Hansen 2006). Within the context of the lava pond hypothesis, partial melting of the mantle results in the formation of the lava to supply individual lava ponds. Lava pond formation could result from the impact of individual large bolides with an ancient thin lithosphere (Hansen 2006). We explore possible scenarios of partial melting and differential crystallization that might result in a crustal-petrologic-geochemical environment that, could, in turn spawn shield terrain formation, following lava pond solidification. Shield terrain formation could evolve significantly after lava pond solidification, depending, at least in part, on later environmental conditions. The hypotheses to be presented might be tested through geochemical and or petrologic modeling.

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