

Heat flows during the formation of ribbon terrains on Venus

J.Ruiz

Instituto de Astrofísica de Andalucía, CSIC, Camino Bajo de Huétor 50, 18008 Granada, Spain (ruiz@iaa.es)

Ribbons are closely and regularly spaced trough existing on many Venus tesserae. There is not consensus about the geodynamics processes involved in their origin, nor about their structural and temporal relations with folds perpendicular to ribbons, and similarly or largely spaced. With independence of temporal relations between ribbons and folds, similarly spaced ribbons on several tessera strongly suggest a thermal control on the deformed layer thickness. These spacing should therefore be related to the brittle-ductile transition depth, which is the depth at which temperatures are sufficiently high to permit ductile creep to dominate over brittle failure. This in turn permits constraints the thermal state of the crust in the time when the features were formed. Ribbon spacing is usually (uncertainty included) in the range between 2 and 6 km. Mean ribbon spacing are 3-5 km for diverse tessera, which implies that relative variations in local heat flow were lower than a factor 2 at the time of ribbon formation (which could vary for each individual tessera). Regularly spaced structural features are related to the thickness of the deformed layer: the spacing of extensional faults is usually 2 to 4 times the thickness of brittle layer. For dry diabase rheology, realistic strain rates, and a surface temperature of 740 K, the implied heat flow would at least 140-280 mW/m². If, as proposed by some authors, Venus has experienced surface temperatures of even 900-1000 K in the past, then heat flow of about 80 mW/m² (the surface heat flow obtained for Venus by scaling of the present-day heat flow) are easy reconciled with ribbon formation. So, lithospheric thermal conditions for ribbon formation could not be hard to satisfy.