

**DYKE SWARM HISTORY OF SE THAUKHUD LINEA REGION, VENUS.** Z. El Kamel<sup>1</sup>, H. El Bilali<sup>2,3</sup>, R.E. Ernst<sup>2,3</sup>, N. Youbi<sup>1</sup> <sup>1</sup>Department of Geology, Faculty of Sciences-Semlalia, Cadi Ayyad University, Marrakesh, Morocco; elkamelzaina@gmail.com, <sup>2</sup>Department of Earth Sciences, Carleton University, Ottawa, Ontario, Canada; hafidaelbilali@cunet.carleton.ca; Richard.Ernst@Carleton.ca, <sup>3</sup>Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia;

**Introduction:** Lineae are elongated regional features on Venus that are associated with extensional lineaments that occur together in narrow elongated topographic highs. Lineae have also been termed fracture belts, densely lineated material, and more recently, groove belts (see summary of nomenclature in [1,2]). Many interpretations emphasize an extensional origin [2], although a recent interpretation suggest they can also represent deformation belts (exhibiting both extensional and compressional features) between small crustal blocks [3]. Magmatic centres can occur along linea and the relationship between linea and their associated magmatic centres can be determined through detailed mapping (e.g. [4]), which also provide insights into the origin of lineae.

**Research Goals:** The area selected for study (Fig. 1) is the Thaukhud Linea region [5], along Parga Chasmata along the boundary between Imdr Regio Quadrangle V-51 and Taussig Quadrangle (V-39). . Multiple corona-like magmatic centres, all unnamed, are, present. The focus of this report is detailed mapping (1:500,000 scale) of graben-fissure lineaments (interpreted as dyke swarms according to the criteria in [6, 7]). These dyke swarms are linked to the magmatic centres along Thaukhud Linea and can provide insight into the relationship between these magmatic centres and the linea.

**Methodology:** Mapping is carried out using the Synthetic Aperture Radar (SAR) of the 1990-1994 NASA Magellan mission, ArcGIS 10.8.2, and JMARS [8] for reconnaissance viewing and creating topographic profiles.

**Graben Systems (Dyke Swarms):** Several thousand extensional lineaments (mainly grabens and fissures) were mapped (Fig. 2) and they have been generalized and grouped into multiple systems (dyke swarms) based on trend and geometry (radiating, circumferential and linear) (Fig. 3).

**Magmatic Centres:** Four main unnamed magmatic centres are linked to the dyke swarms (Fig. 3).

*Centre 1:* The radiating swarm is dense to the NE and SE of the centre, and partially, to totally, flooded by younger flows to the SW and the E. The circumferential swarm is partially flooded by younger flows. The mapped circumferential dykes indicate a radius of about 180 km. Centre 1 is located at about 850 km SSE of Nodi Corona and 550 km SE of Samsing Corona.

*Centre 2:* This centre exhibits clear radiating and circumferential dykes. The radius of the circumferential swarm is about 95 km, making it smaller than centre 1. Two small rift arms appear to diverge at this centre and thus this centre is possibly the locus of triple junction rifting [9]. This centre is located about 450 km NNE of Centre 1.

*Centre 3:* This centre shows both radiating and circumferential dykes. Radiating dykes appear to be masked by rift faults both north and south of the centre. Circumferential dykes are dense and show a radius of about 160 km radius. This centre is also the locus of a local triple junction rifting with two rift arms to the SE and SW (cf [9]). This centre is closest to centre 2 (200 km) and 260 km SSE of Nodi Corona.

*Centre 4:* This cryptic centre is located at 600 km ENE of centre 1 and about 650 SE of centre 2. Only radiating dykes were mapped. Circumferential dykes are not recognized, possibly due to flooding by younger lava flows.

**Future work:** Mapping of graben systems will be completed and then lava flows and the lineaments of Thaukhud Linea will be mapped in detail (1:500,000 scale). This will be followed by integration of information on graben-fissure systems (dyke swarms), lava flows and linea lineaments, in order to provide a geological history for the area and insights into the nature of Thaukhud Linea.

**Acknowledgments:** Magellan SAR and altimetry images were obtained from <https://astrogeology.usgs.gov/search/?pmi-target=venus>, and was based on data obtained from <https://pdsimaging.jpl.nasa.gov/volumes/magellan.html#mgnFMAP>.

**References:** [1] Ivanov, M.A., Head, J.W. Space Sci., 2011, V. 59, P.1559-1600.[2] Ivanov, M.A., Head, J.W (2015), 113-114, 10–32. [3] Byrne, P.K. et al. (2021) PNAS, 118, e2025919118. [4] Oukhro, R. (2023) LPSC abstr. [5] Brian, A.W et al.. (2005) USGS SIM 2813. [6] Grosfils, E.B., Head, J.W. (1994) GRL, 21, 701–704. [7] Ernst, R.E. et al. (2003) Icarus, 164, 282–316. [8] Christensen, P. R. et al. (2009) AGU Fall Meeting, Abstract #IN22A-06. [9] Graff, J.R. et al. (2018) Icarus, 306, 122-138.

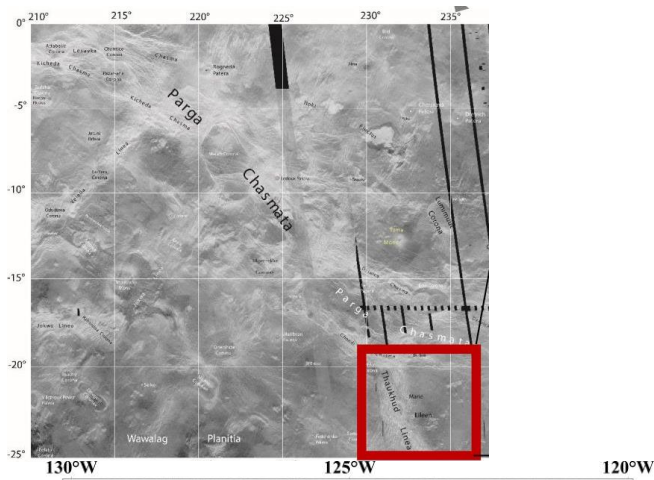


Figure 1: Study area

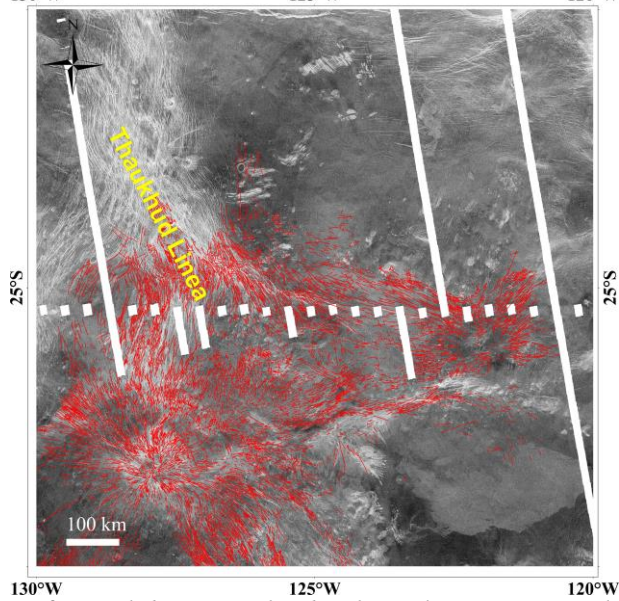


Figure 2: Detailed mapping of graben-fissure lineaments (several thousand to date).

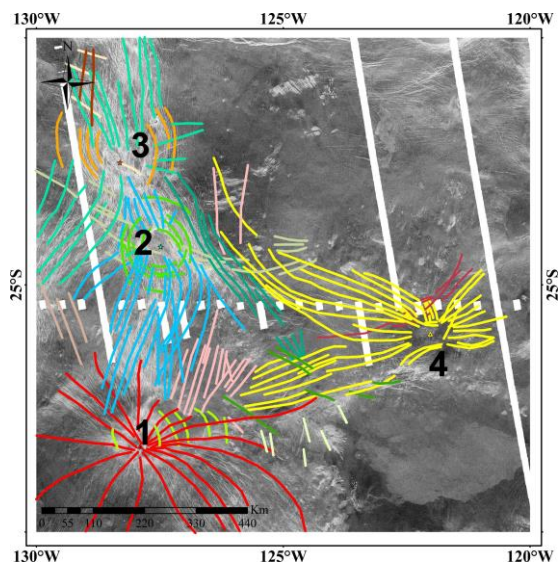


Figure 3: Generalized distribution of graben systems (colour coded to represent different radiating, circumferential and linear swarms) and their unnamed magmatic centres, labelled (1-4).