

**DYKE SWARM AND LAVA FLOW HISTORY IN EASTERN NSOMEKA PLANITIA, VENUS.** F.Z. Khadraoui<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>Cadi Ayyad University, Marrakech, Morocco; fatykhadraoui@gmail.com, <sup>2</sup>Department of Earth Sciences, Carleton University, Ottawa, Ontario, Canada; hafidaelbilali@cunet.carleton.ca; richard.ernst@ernstgeosciences.com; <sup>3</sup>Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia.

**Introduction**—In this study (Fig. 1) we are investigating the magmatic history to the west of Imdr Regio, in northeastern Nsomeka Planitia, southern Isabella Quadrangle (V-50), through detailed (1: 500,000 scale) mapping of the volcanic flows and graben sets (thought to be the surface expression of dyke swarms) [1-2]. Imdr Regio is a broad topographic and geoid high (thought to overlie a major mantle plume), with a major shield volcano, Idunn Mons [3], potentially recent volcanism [4] and associated Olapa Chasma (rift) [3] that extends into our study area (Fig. 1).

Mapping in this area is made difficult by the presence of a dense distribution of wrinkle ridges (Fig. 2, [5] which can obscure the grabens and flows. A second complication is that grabens are sparser in this region than in other regions of Venus. Two interpretations are being considered: 1) that graben systems (linked to dyke swarms) are indeed rarer in this region, or 2) that the radiating, circumferential and linear graben sets abundant in other regions [1-2] are also present here, but are more completely obscured by a greater thickness of younger lava flows.

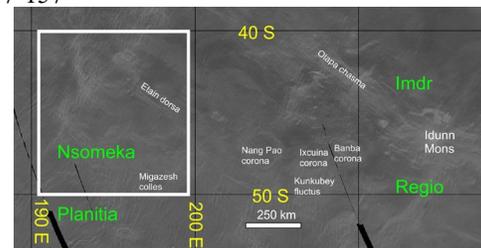
**Mapping of graben systems (dyke swarms):** Careful mapping using the full (100 m / pixel) resolution of the Magellan SAR images is revealing enough grabens for grouping into distinct sets. Most dramatically, multiple circumferential arcs of grabens (dykes) associated with Kupa Patera indicate three stages of development associated with three centres (marked by stars) (Fig. 3).

**Mapping of lava flows:** Preliminary mapping of an important lava flow field in the NE of the study area (Fig. 4) indicates dominant flow from the east from the direction of Imdr Regio.

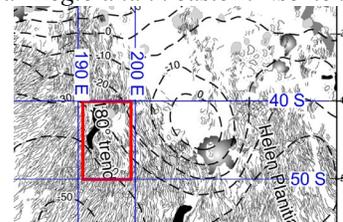
**Future Work:** The careful search for additional grabens will continue (against the background of dense wrinkle ridges). We will also assess whether some particularly linear (rather than the normally sinuous) wrinkle ridges may represent original extensional line-

aments (grabens) that were re-used during the process of wrinkle ridge formation. In addition, lava flows will be mapped and integrated with the graben patterns to distinguish the flows associated with Nsomeka Planitia from those from Kupa Patera, and from Imdr Regio, and develop the geological history for the region. In addition we will integrate the topography profile of Kupa Patera (Fig. 5) with identification of the three centres to construct a geological history for Kupa Patera.

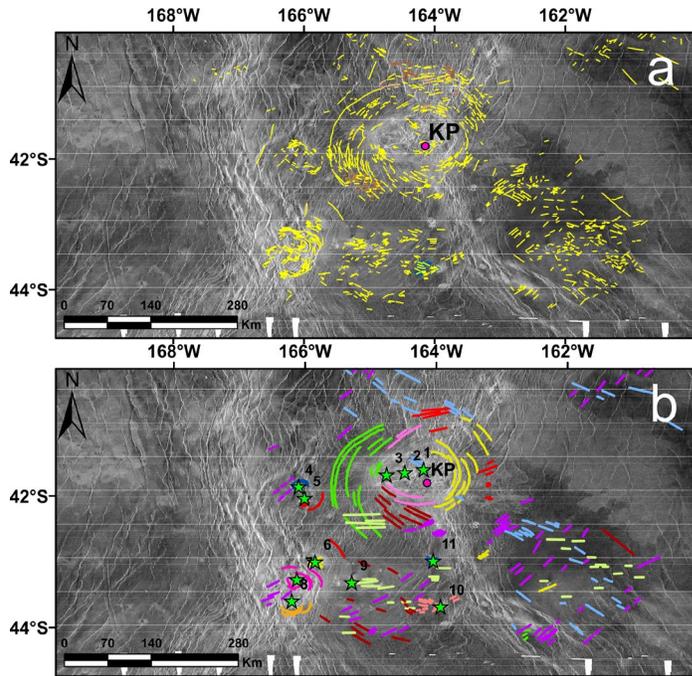
**References** [1] Grosfils and Head (1994) GRL. [2] Buchan K.L. and Ernst R.E. (2021) Gond. Res. [3] López I. et al. (2022). J. Volcan. Geotherm. Res., 421, 107428. [4] Smrekar S.E. et al. (2010) Science, 328, 605–608. [5] Bilotti F and Suppe J. (1999) Icarus, 139, 137-157



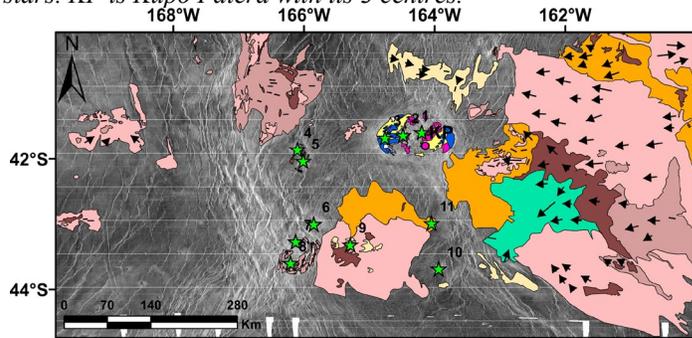
**Figure 1.** Location of study area to the west of Imdr Regio and in eastern Nsomeka Planitia.



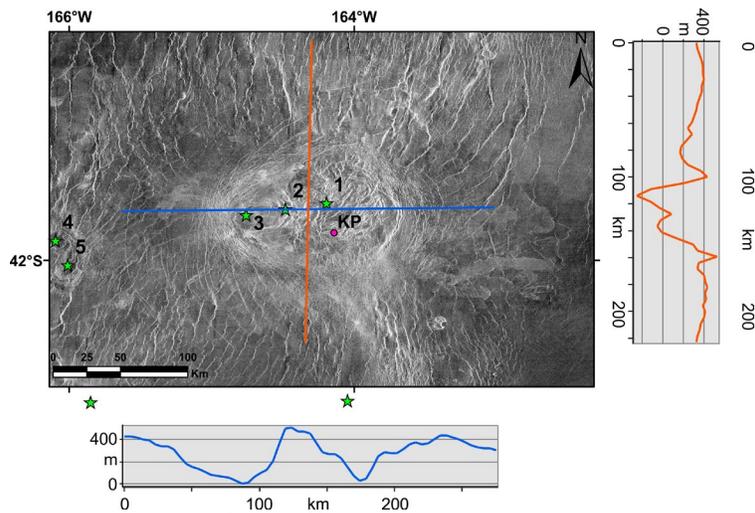
**Figure 2.** Distribution of wrinkle ridges (and contours for the geoid surface) for Imdr Regio [5] on which the location of our study area is shown (red box). The centre of Imdr Regio (to the east) is associated with a geoid high.



**Figure 3.** Grabens of study area. a) all mapped grabens. b) Generalized grabens. Magmatic centres are noted by stars. KP is Kupo Patera with its 3 centres.



**Figure 4.** Preliminary mapping of lava flow of study area with superimposed flow directions.



**Figure 5.** Topographic profiles across magmatic centre Kupo Patera (KP) which has three centres distinguished by the circumferential patterns (Fig. 3b).