MAGMATIC FEEDER SYSTEMS OF THE LO SHEN REGION, SOUTHERN MARGIN OF EASTERN OVDA REGIO, VENUS. A. Singhal[1] R.E. Ernst[1,2], H. El Bilali[1,2] [1]Carleton University, Ottawa, Ontario, Canada; AnoushkaSinghal@cmail.carleton.ca; richard.ernst@ernstgeosciences.com; hafidaelbilali@cunet.carleton.ca, [2]Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia

Introduction: Lo Shen Valles is located on the southern margin of eastern Ovda Regio and is more than 225 km long (Fig. 1). The upper portion of Lo Shen Valles region (Fig. 2) is the locus of sources for the channelized lava flows of Lo Shen Valles and for additional smaller lava channel systems.

In the present study we are interested in: 1) determining the relative timing of the channelized systems and characterizing their magma reservoir sources; 2) and developing a geological history for the region.

Intrusions as feeders for the channelized flows:

The lava sources in our study area are marked by extensive shallow depressions from which channelized flows originate (Fig. 2). Some sources are small and sub-circular (e.g., labelled M and B in Fig. 2b) and some are more elongate to irregular in shape (e.g. labelled F1 and F2), and all seem to have flooded floors and are provisionally interpreted to represent roof-collapse above shallow magma reservoirs (see similar interpretation in [1]). Those reservoirs that have an elongate shape or distribution (C) are suggested to be associated with dykes (e.g. [2-3]) while those of more irregular shape (e.g. F1 and F2) may represent more sill-like reservoirs.

In addition, there are pit chains/troughs (e.g. J1, J2, A1-A3) representing collapse features above underlying dykes [4], some of which (i.e. A1-A3) are also sources for channelized flows (Fig. 2).

Geological history: These depressions and their channelized flows (Fig. 2) were emplaced onto a smooth surface, representing a lava flooding event that is bordered by unflooded tesserae on the north and east, suggesting flooding of a broad topographic low. However, the area of lava flooding actually corresponds to a topographic high (about 140 x 80 km, and about 300-500 m high) (Fig. 3). We suggest that uplift must have occurred after regional lava flooding; otherwise, the adjacent tesserae (which are located downhill in the present topography) would have been flooded. We speculate that this elongate domical uplift was caused by filling of an underlying sill like magma reservoir more than 50 km across and 100s of m thick. An alternative interpretation as primary topography associated with a volcanic accumulation (e.g. edifice) is less likely given the smoothness of the lava flooding and the absence of any summit structures.

Assessing magma level in intrusions: This inferred magma reservoir under the broad uplift could also be responsible for feeding magma upward into dykes with surface expression as pit chains (A1-A3 in Figs. 2b, 3). These pit chains have a maximum elevation of about 4700 m, indicating a 200-300 m difference in elevation from that at which the channelized flows started: 4313, 4489 and 4458 m (Fig. 3). This would suggest that the level of magma in dykes A1-A3 was 200-300 m below the surface. We are applying this approach (comparing the elevation at which channelized flows begin with the topographic changes) to more broadly assess magma level in the different reservoirs in the study area, both spatially and through time.

Linking dyke-like intrusions to regional swarms: An additional aspect is detailed mapping of the graben-fissure systems in the unflooded adjacent areas (Fig. 4) to identify regional dyke swarms which could be linked with the inferred dyke-like near surface intrusions in our study area, as discussed above.

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] MacLellan L.M., et al. (2021). E.-Sci. Rev., 220, 103619. [2] Ernst, R.E., Buchan, K.L. (1997). S. Afr. J. Geol., 100, 319-334. [3] Ernst, R.E., et al. (2019). J. Volcan. Geotherm. Res., 384, 75-84. [4] Davey, S.C., et al. (2013) Can. J. Earth Sci., 50, 109-126. [5] Herrick R.R. et al. (1999) GRL, 26, 803-806.

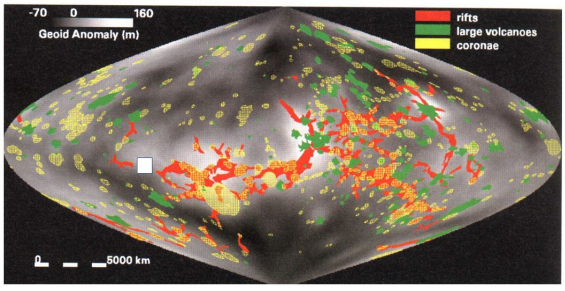

Figure 1: *Location of study area on global map of [5].*

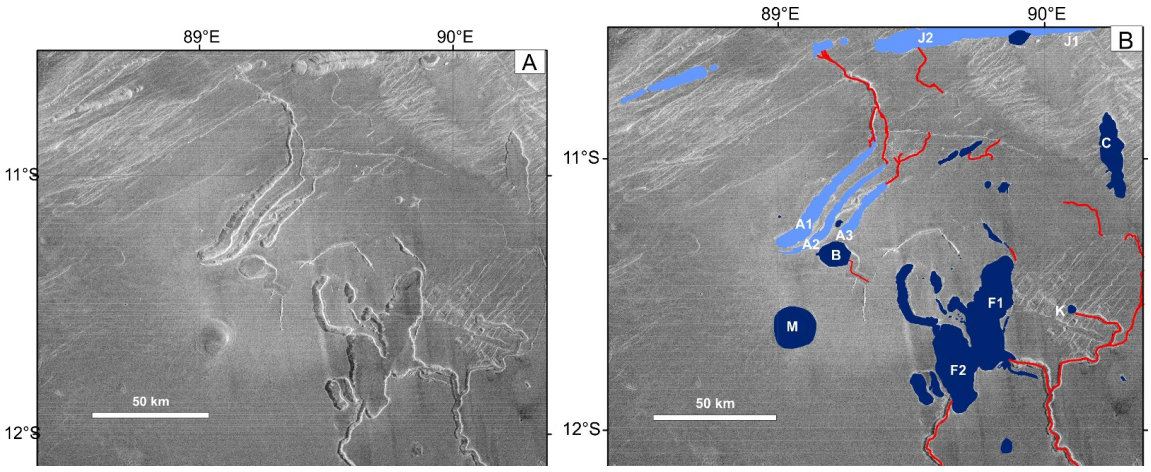

Figure 2. *Upper portion of Lo Shen Valles region, showing distribution of pit chains (light blue) and other depressions (regular or irregular in shape) (dark blue), and lava channels fed from them (red). Background is left-looking Cycle 1 image from Magellan image.*

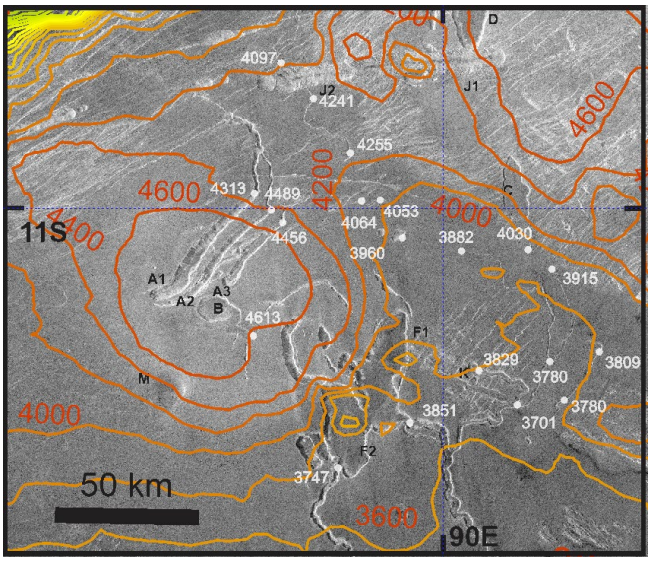

Figure 3: *Upper portion of Lo Shen Valles with shallow intrusions (labels in black), elevation contours and labels in red/orange, and elevation at key points along channelized flows (white lettering). Background image is from Cycle 1 left looking Magellan SAR.*

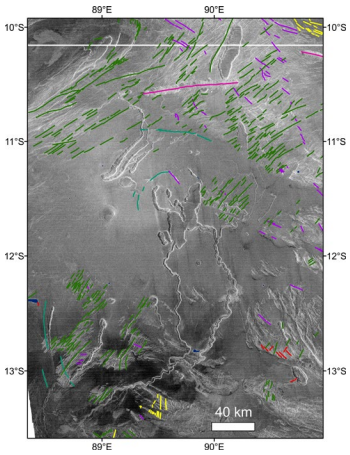

Figure 4: *Regional graben systems (mainly NE-trending green, and NW-trending purple). These likely represent the surface expression of regional dyke swarms, and further mapping will investigate whether these can be linked to magmatic centres outside the area.*