UNNAMED LAVA FLOW SYSTEM ALONG THE NORTHEASTERN MARGIN OF VAIDILUTE RUPES, VENUS. L. M. MacLellan[1], R. E. Ernst[1,2] and H. El Bilali[1], [1]Department of Earth Sciences, Carleton University, Ottawa, ON, Canada, [2]Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia.

Introduction: Preliminary 1:500,000 scale mapping of an unnamed flow system, accompanying structures and graben within the Kaiwan Fluctus quadrangle (V-44) provides insights into its source area, flow path and flow history. The flow system occurs along the northeastern margin of Vaidilute Rupes (VR) and Astkhik Planum (AP), within the adjacent lowlands. The mapped section spans 11.5°-31.5° E, 33.5°-40° S (Fig. 1). Our mapping recognizes more flow units than the previous 1:5,000,000 scale mapping done as part of the Quadrangle Series [1] and expands further by locating the source of the flow system. (Fig. 2).

Methods: Our geological mapping was done in ArcGIS ArcMap version 10.6 using Magellan left-looking and right-looking Synthetic Aperture Radar (SAR) images and Magellan altimetry data provided by the USGS. The Magellan right-looking SAR images were only available for the portion of our mapping south of 36.8° S. The full resolution SAR images were used (75 m per pixel).

Geological units were distinguished based on changes in radar brightness and the altimetry data assisted in identifying the local patterns of magma flows.

Components: Several key magmatic features in this region have been identified.

Unnamed fluctus. Located at 19° E, 28° S, a radar-bright fluctus (**f1**) extends 370 km in length and is 50-70 km wide (Fig. 3). Topography and the lobate morphology supports a flow direction towards the southeast. Approximately 15 km west of this main flow is an additional radar-bright flow (**f2**) that is 10 km in width. **f2** and its channel can be traced for at least 620 km. This flow likely extends further, however, the southern end of the flow is obscured by a radar-intermediate unit (**X**) (Fig. 3). A faint partial outline of **f2** can be traced underneath **X**, indicating that it is surficial and is potentially pyroclastic in nature. **X** may be sourced from Sephira Mons, located 500 km southeast of the unit [1].

The radar-bright flows, **f1** and **f2**, are separated by a radar-darker flow (**f3**) that is interpreted to be younger based on it flowing through and fragmenting the bright flows. If this holds, then the radar-bright flows **f1** and **f2** may potentially belong to a single unit that was seperated by later flows.

Source area. Within **f1** there are several bifurcating channels and **f2** has a single 480 km long channel (black dotted line in Fig. 1 and 3). This channel can nearly be tracked back (within 40 km) to an arcuate dyke-like source (**S**) northwest of **f1** and **f2** (Fig. 2). The dyke is 37 km long and 2.5 km wide (Fig. 2). Two flows emanate from this dyke-like source: 1) a radar-bright anemone-like flow that is 36 km x 36 km and is coming from the northern portion of the dyke, and 2) a channelized flow off the eastern margin of the dyke, that eventually fans out into a broad radar-intermediate flow (**f4**) (Fig. 2). The above-mentioned channel that feeds **f2** starts within **f4**. We propose that this channel represents a faster moving portion of **f4** that became channelized, and so **f1** and **f2** are ultimately sourced from the arcuate dyke.

The arcuate dyke appears to be a part of a more complex magmatic centre that is composed of at least three circumferential structures, likely representing a corona cluster (Fig. 4). The majority of these structures have been covered by later flows, leaving only circumferential graben and elevated rims to indicate their presence.

Future work: To fully understand the flow emplacement history of the region further geological mapping is required. We plan to map the corona cluster in more detail (Fig. 4) and the extensive radar-dark flows to the north and west to test their link to the corona cluster (Fig. 1). Continued mapping of the shield volcanoes, graben and wrinkle ridges in this area will be conducted. The mapping will be linked to previous detailed mapping in the southern portion of Astkhik Planum centering on Derceto Corona [2] to gain insights into the history between Astkhik Planum, Vaidilute Rupes and the adjacent lowlands.

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

References:

[1] Bridges, N.T. and McGill, G.E. (2002) *USGS Geologic Investigations Series* I-2747. [2] MacLellan, L.M. et al. (2021) *Earth-Science Reviews* (in review).

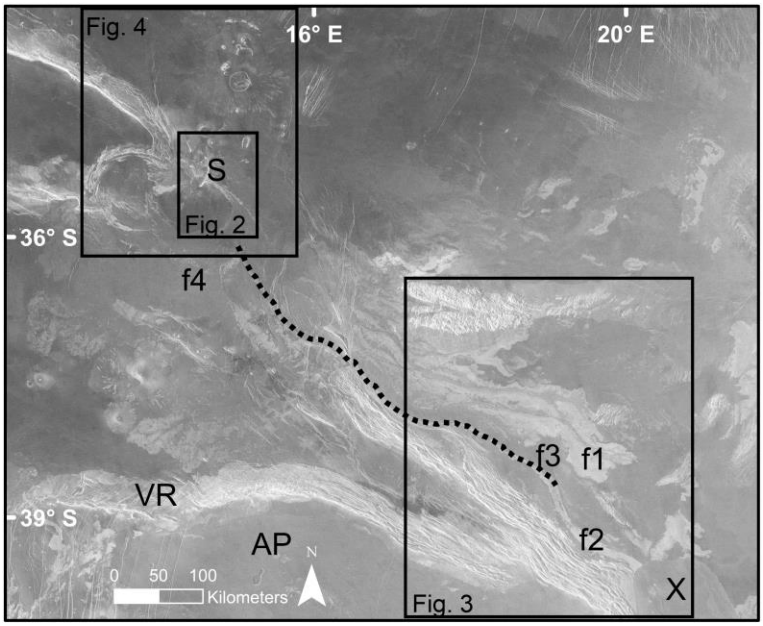

Fig. 1. Left-looking Magellan SAR image (30% transparency) of study area with boxes indicating the location of subsequent figures. VR = Vaidilute Rupes, AP = Astkhik Planum, S = source, f1 = flow 1, f2 = flow 2, f3 = flow 3, f4 = flow 4, X = surficial unit, black dotted line = f2 channel.

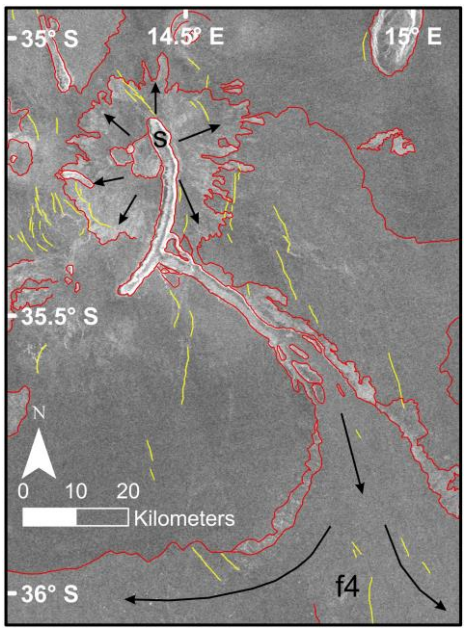

Fig. 2. Arcuate dyke-like source with black arrows indicating the direction of flows from it. S = source, f4 = flow 4, red lines = flow and structure outlines, yellow lines = graben.

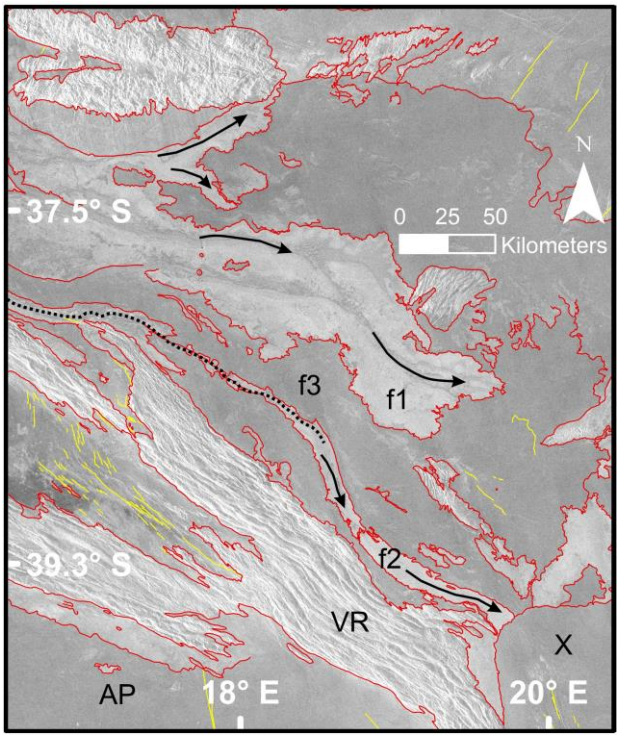

Fig. 3. The flows f1, f2 and f3 with flow directions (black arrows). f1 = flow 1, f2 = flow 2, f3 = flow 3, X = surficial unit, black dotted line = f2 channel, red lines = flow and structure outlines, yellow lines = graben, VR = Vaidilute Rupes, AP = Astkhik Planum.

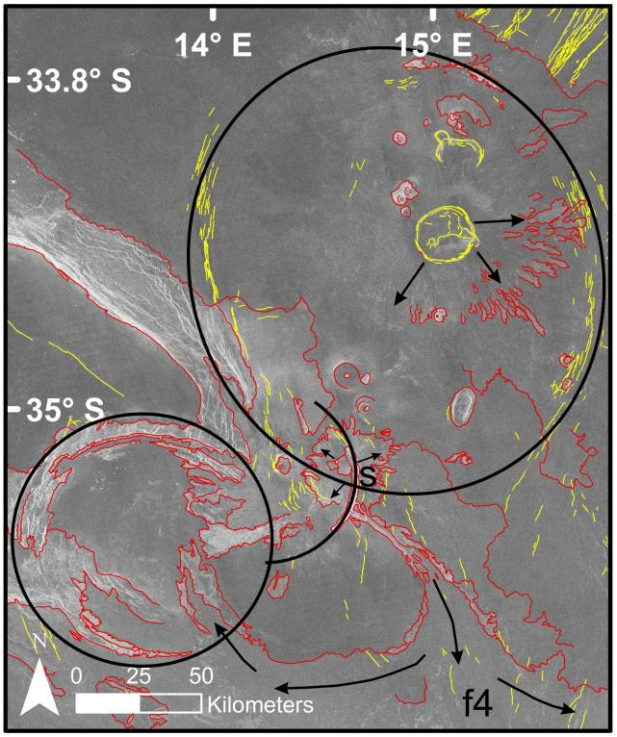

Fig. 4. Three circumferential structures (black ellipse, circle and arc) marking a possible corona cluster. The black arrows indicate flow directions. S = source, f4 = flow 4, red lines = flow and structure outlines, yellow lines = graben.