

**LAVA FLOWS OF SAMODIVA MONS REGION, SOUTHEAST OF BETA REGIO, VENUS.** D. G. Malyshev<sup>1</sup>, R. E. Ernst<sup>1,2</sup>, H. El Bilali<sup>1,2</sup>, M. A. Ivanov<sup>3,4</sup>. <sup>1</sup>Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia: malyshev.danil13@gmail.com, <sup>2</sup>Department of Earth Sciences, Carleton University, Ottawa, Canada, <sup>3</sup>Vernadsky Institute, Russian Academy of Sciences, Moscow, Russia.

**Introduction:** Samodiva Mons (13.6° N, 291.0° E) and surrounding area (Fig. 1) are located east of Beta Regio major plume center [1], at the southern end of Hyndla Regio, a flat-topped highland consisting mostly of tessera [2,3]. The Samodiva volcano represents an edifice, which is ~70 km wide and ~0.7 km high, topped with the summit caldera, which is ~25 km diameter and ~0.5 km deep. Systems of radiating graben surround the central edifice of Samodiva Mons. Parts of the volcano were mapped at 1:5M scale [4]. Here we present the results of our mapping of the volcano at the scale of 1:5K and a reconstruction of a sequence of major events unraveled during our mapping.

**Graben System History:** Mapping of graben systems, which can be interpreted as the surface manifestation of dyke swarms [5], reveals seven different trends of dykes (Fig. 2). The most widespread are radial (yellow lines, *Radial\_S*) and circumferential (white lines close to the center, *Concentric\_S*) swarms originate from Samodiva Mons; the sources of the five other graben systems are not yet identified. There are two north-south trends to the west of Samodiva Mons (*C1-C2*). The northwest-southeast trend (*C3*) probably originates from Zhivana corona, located outside the study area to the west. On the east side there are three north-south trends (*C1, C4-C5*), *C4* most likely has an unnamed corona to the north-east as the source. The age relationships, based on cross-cutting relationships, are (oldest to youngest): *C3, C1, Radial\_S, C2, Concentric\_S*. The relative ages of *C4* and *C5* are not yet constrained.

#### **Samodiva Mons Lava Flows:**

**Western Sector Lava Flows:** Some of the youngest flows that spilled out of the volcano Samodiva are presented in Fig. 3. In this area, the presence of an isolated fragment (kipuka) of tessera (white). Tessera remnants were flooded by younger lava flows and suggest broader extension of tessera from the north to the south closer to the area where the volcano is located. The main area is covered by lava flows, the length of the youngest flow (*fSM-W-4*) is about 95 km. In Fig. 3, the relative age of the flows usually increases from east to west, however, the age of some flows is uncertain, so the age of the flow "*fSM-W-6*" (the direction is shown by the red arrows in Fig. 3) is not determined in relation to the rest, we can only

say with certainty that it is younger than the "*fSM-W-1*" flow, because it is superimposed on it.

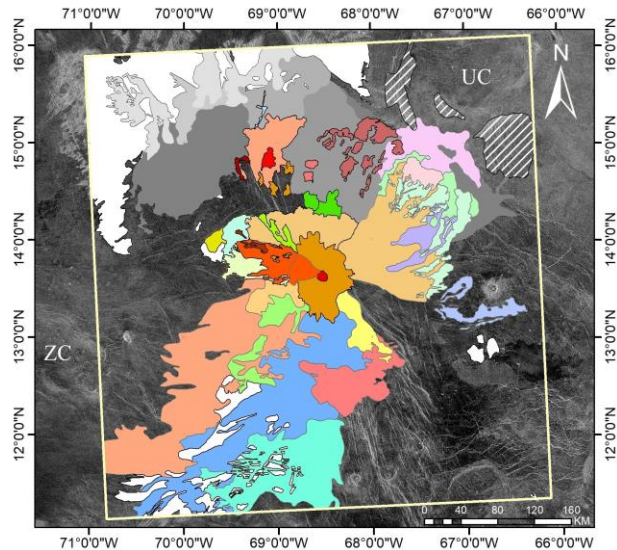
**North Sector Lava Flows:** Most of this sector consists of tessera (*t*) and regional plains (*rp*) (Fig. 4). The latter group of units can be divided in several units by their radar backscatter, which indicates different roughness of the surface (for example, due to different degree of mantling by wind-blown material). There are also distinct lava flows superimposed on regional plains, five of which are probably originating from dykes underlying grabens (*fSM-N-1* to -5); another flow (*fSM-N-6*) has a small shield volcano as a source. The North-Northeast sector is overlain by regional plains. Apart from that, the vast area is covered by flows (*fSM-NNE-1, -2*) superimposed on regional plains and originating from dykes underlying grabens.

**East Sector Lava Flows:** There are at least five lava flow units, all of which originated at Samodiva Mons' summit, and are distinguished by trends and radar backscatter (*fSM-NE-1* to 6 and *fSM-E-1, -2*) (Fig. 5); the flows superimpose regional plains. Wrinkle ridges occur within the whole East sector and may serve as a relative age marker in this area. They are gradually reduced in length and number toward the summit of the volcano. Being superimposed on *fSM-NE-1, -2*, wrinkle ridges are covered by *fSM-NE-2, -3* and *fSM-E-1, -2*.

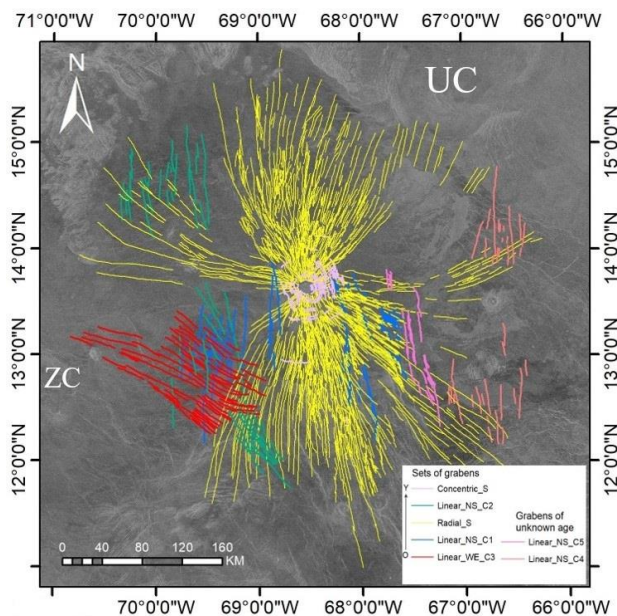
**South-Southwest Sector Lava Flows:** This sector is covered by vast lava flows, which may have been sourced from Samodiva Mons or be a part of regional plains. The area is dominated by tesserae and is crosscut by various flows. This sector is also characterized by a lower density of wrinkle ridges as compared to the North and East sectors, which may indicate a younger age of South sector units.

**Discussion:** At this stage of mapping it can be concluded that: 1) Grabens (interpreted to overlie dyke swarms) can be grouped into at least seven sets on the basis of trends and cross-cutting relationships; 2) Regional plains on the North seem to be older than lava flows and covered by aeolian materials from tesserae; 3) On the east side of the volcano there are several distinct lava flows originating from Samodiva Mons, and these are interpreted to be younger than the yellow radiating graben system; 4) Most of the map area is covered by wrinkle ridges, which may serve as a marker of relative ages.

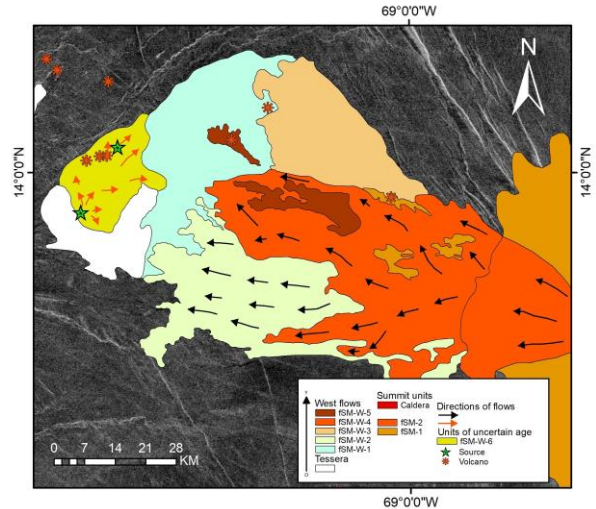
**References:** [1] Basilevsky A.T. and Head J.W. (2007) *Icarus*, 192, 167–186. [2] Basilevsky A.T. (2008) *USGS SIM* 3023. [3] Ivanov M.A. and Head J.W. (2011) *Planet. Space Sci.*, 59, 1559–1600. [4] Tandberg E. R. and Bleamaster L. F. (2010) *LPS XLI*, Abstract #1816. [5] Buchan K. L. and Ernst R. E. (2021). *Gond. Res.*, 100, 25–43.



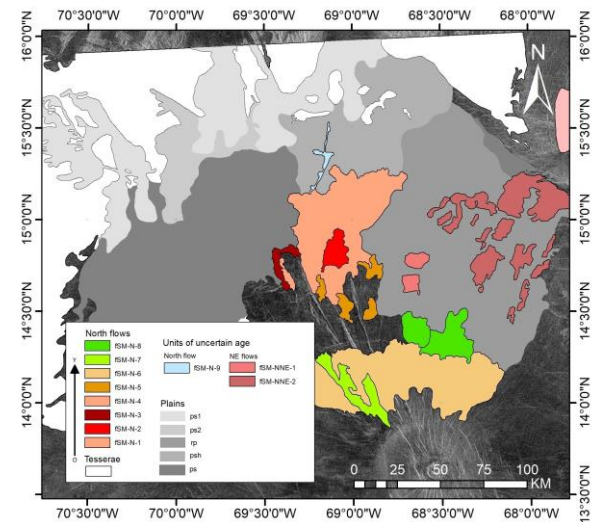
**Figure 1** – Currently mapped geological units. Colors indicate different lava flow units likely belonging to Samodiva Mons. Grey, white and striped units are plains, tessera, densely deformed units. See details in Figs. 3-5. “ZC” – Zhivana corona, “UC” – unnamed corona.



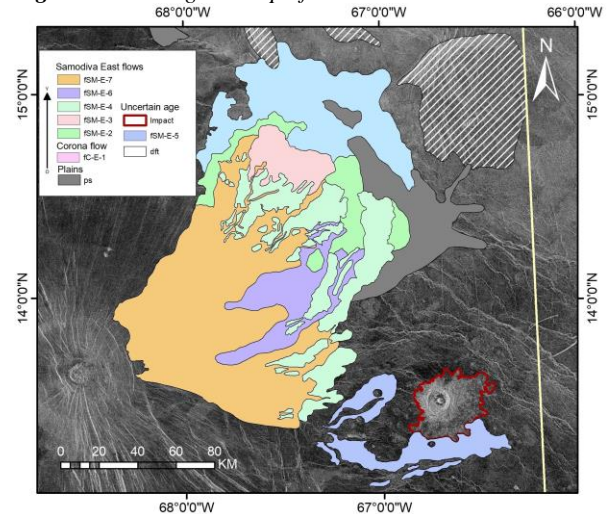
**Figure 2** – Graben-fissure systems. “ZC” – Zhivana corona, “UC” – unnamed corona.



**Figure 3** – Geological map of the western sector with lava flows, tessera, small shield volcanoes and superimposed flow directions.



**Figure 4** – Geological map of the North sector.



**Figure 5** – Geological map of the East sector.