SAPAS MONS, ATLA REGIO, VENUS: ANATOMY OF A VERY LARGE AND POTENTIALLY ACTIVE SHIELD VOLCANO. M. Ankach[1], H. El Bilali[2], R.E. Ernst[2,3], J.W. Head[4], N. Youbi[1] [1]Department of Geology, Faculty of Sciences-Semlalia, Cadi Ayyad University, Marrakesh, Morocco; mouadankach@gmail.com, [2]Department of Earth Sciences, Carleton University, Ottawa, Ontario, Canada;hafidaelbilali@cunet.carleton.ca; richard.ernst@ernstgeosciences.com, [3]Faculty of Geology and Geography, Tomsk State University, Tomsk, Russia. [4]Department of Earth, Environmental and Planetary Sciences, Brown University, Providence, Rhode Island, USA.

Introduction: Sapas Mons is a large, 600 km diameter, 2.4 km high (relative to surrounding plains) shield volcano in the Atla Regio area of Venus (Fig. 1). On the basis of a global census and characterization of large shield volcanoes on Venus [1], Sapas falls at the large end of the largest large shield volcanoes (425-750 km diameter) in the global population. It is thus of very high interest to characterize and study in more detail. Sapas was previously characterized 28 years ago by Keddie and Head [2]. General mapping from this earlier study identified 6 main flow units, a set of circumferential fractures (75 – 100 km in diameter) potentially reflecting caldera subsidence processes, and a set of graben radiating away from Sapas Mons, which were interpreted as a radiating dyke swarm. Keddie and Head [2] also emphasized the similarities in size with the largest of the Hawaiian shield volcanoes, Mauna Loa volcano. Gravity data were also inferred to suggest an underlying actively upwelling plume [2,3].

Goals of the Present Study

In the current study, we build on this previous work [1] and undertake much more detailed geologic mapping (1:500,000 scale) in order to fully characterize this very distinctive, very large, large shield volcano located in one of the key areas suggestive of presently active upwelling and potentially recording current volcanic activity [4]. In addition, we call on nearly 30 years of additional research on shield volcanism on Venus, and a wide range of additional concepts, including a better understanding of terrestrial mantle plumes, and Large Igneous Province (LIP) related phenomena, that have recently been shown to have potential application to Venus [e.g., 5-8].

Goals of the current study are as follows:

1) Subdivision of the 6 main flow units of Keddie and Head [2] into subunits, determination of relative ages, location of source, and how flow unit length, radar properties, and source vent locations have changed with time.

2) Documentation of the flow units that can be linked to each of the main summit calderas of Sapas Mons and relation of volumes to caldera subsidence events.

3) Identify links between flows and radial graben to test the theory that they represent radial dykes rather than tectonics. If support is found for dyke origins, projection of orientations back toward the edifice to locate the magmatic source of dyke propagation.

4) Characterization of the 75-100 km diameter circumferential system [2] and assess its origin (flexural deformation, concentric dyke system?).

5) Search for any trace of a broader circumferential swarm surrounding Sapas Mons; such are associated with many terrestrial LIPs [8].

6) Is there any evidence of plume tail magmatism, that would be expected to follow plume head magmatism. If no such plume tail magmatism is identified then assess whether Sapas is still at the plume head stage and has not reached the plume tail stage, perhaps consistent with its gravity signature.

A broad overview of our initial Sapas Mons geologic mapping is shown in Fig. 2, and the nature and detailed flow identification and stratigraphic relationships are shown in three subareas in Figs. 3-5.

References: [1] Ivanov M.A. and Head J.W. (2021) 12th Moscow Solar Syst. Symp., 12MS3-VN-PS-06. [2] Keddie S.T., and Head J.W. (1994) Earth, Moon Planets, 65, 129-190. [3] Solomon S. C. et al. (1993) EOS Trans. Am. Geophys. Union 74, 375. [4] El Bilali H. et al. (2022) LPSC 2022 abstract. [5] Head J.W. and Coffin M. (1997) In: AGU GM, 100, 411. [6] Hansen, V. (2007) Chem. Geol., 241, 354. [7] Ernst R.E. et al. (2007) In: Superplumes: Beyond Plate Tectonics. Springer. [8] Buchan K.L. and Ernst R.E. (2021). Gond. Res., 100, 25-43.

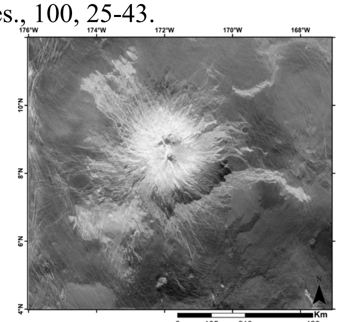

Figure 1. *Sapas Mons. Magellan SAR image.*

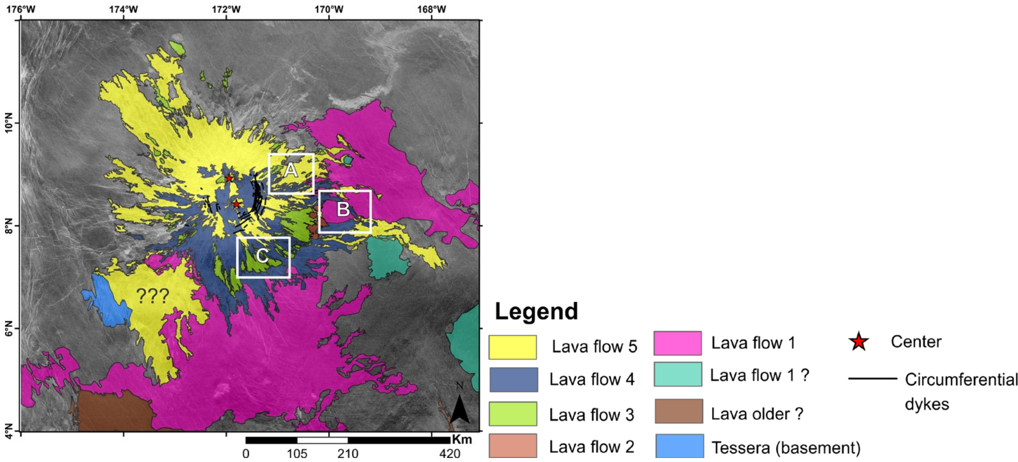

Figure 2. *Preliminary mapping of Sapas Mons with flow units distinguished superimposed on Magellan SAR image.*

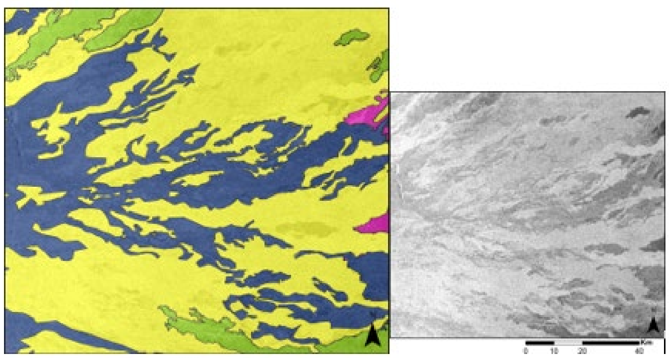

Figure 3. *Younger radar dark flow crossing earlier radar bright flow. Area A in Fig. 2.*

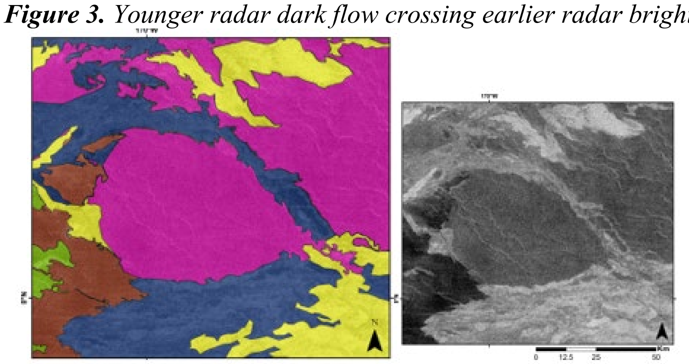

Figure 4. *Pink lava flow represents an older plains unit crossed by younger flows. Area B in Fig. 2.*

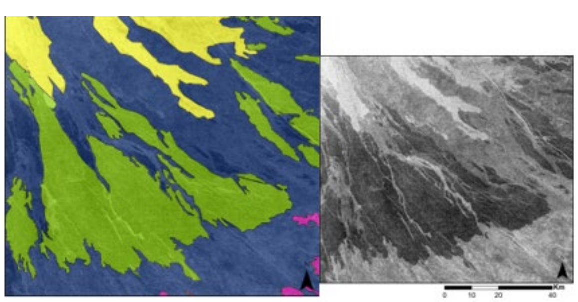

Figure 5: *Green (radar dark) flows are superposed on blue (radar bright flows). Area C in Fig. 2.*