SAPAS MONS, ATLA REGIO, VENUS: ANATOMY OF A VERY LARGE 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 (james_head@brown.edu).

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. Sapas was previously characterized by Keddie & 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 grabens radiating away from Sapas Mons, which were interpreted as a radiating dyke swarm. Keddie & Head [2] also emphasized the similarities in size with the largest of the Hawaiian shield volcanoes, Mauna Loa. Gravity data suggest an underlying actively upwelling plume [2,3].

Research Goals: In the current study, we build on this previous work and undertake much more detailed geologic mapping (1:500,000 scale) in order to fully characterize this very distinctive, large shield volcano.

Goals of the current study include: 1) Subdivision of the 6 main flow units of Keddie & 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.

Sapas Lava Flows: Our synoptic map of Sapas Mons lava flows is shown in (Fig. 1), and the nature and detailed flow identification/stratigraphic relationships in 3 subareas in (Figs. 2-3); cross-cutting relationships are shown in Figs. 4-7.

Summary: The mapping of the different generations of lava flows has allowed us to deduce the chronology of events related to the location of the lava flows and their origins as shown in the attached figures. We distinguish two magmatic centers surrounded by circumferential dykes (in the form of a ring) which interpreted to be related to the collapse of a caldera. On a large scale, dark lavas represented by the red and yellow colors are oldest, followed by gray lavas and then by light lavas represented by the white color; in some areas grayish lavas may be superimposed on whitish lavas, suggesting whitish and grayish lava contemporaneity. We were also able to subdivide dark lavas into two types, yellow and red; yellow flows are interpreted to originate at the South Magmatic Center (SMC) while red lavas emerge from the North Magmatic Center (NMC). Emplacement of the lava flows represented by blue color occurred before Sapas Mons.

References: [1] Ivanov M.A. & 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. AGU 74, 375. [4] El Bilali H. et al. (2022) LPSC 2022 abstract. [5] Head J.W. & 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. & Ernst R.E. (2021). Gond. Res., 100, 25-43.

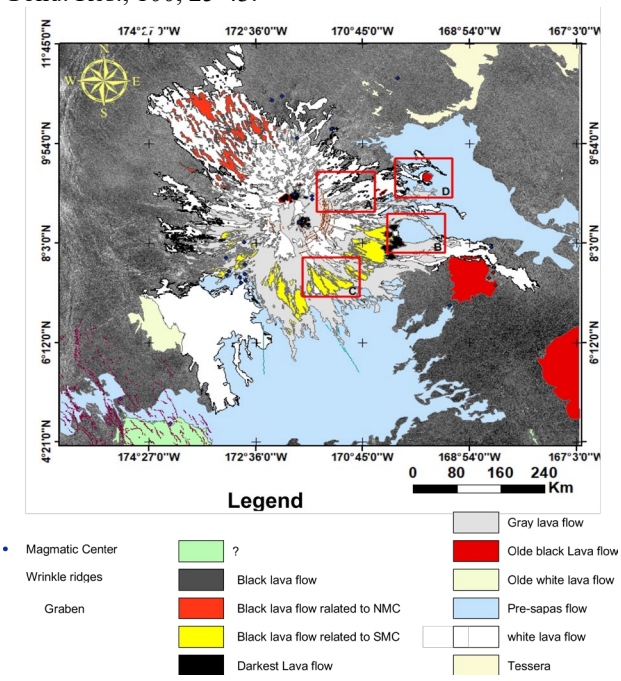

Fig. 1. Preliminary mapping of Sapas Mons with flow units distinguished superimposed on Magellan SAR image.

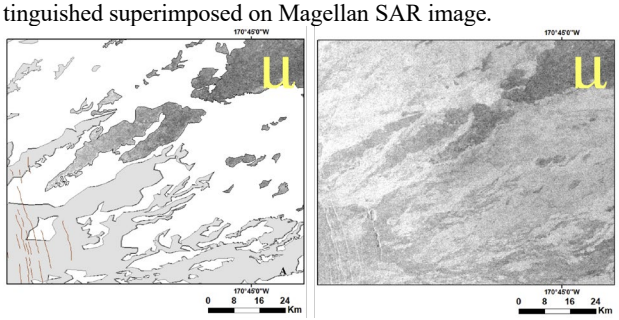

Fig. 2. Younger radar dark flow crossing earlier radar bright flow. Area A, Fig. 1.

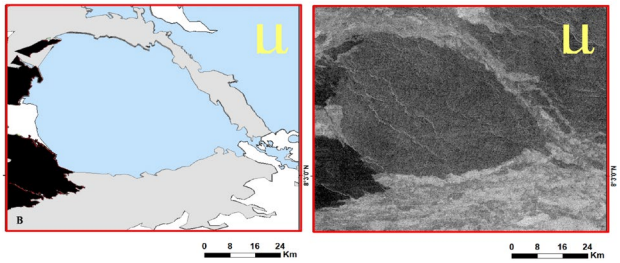

Fig. 3. Pink lava flow represents an older plains unit crossed by younger flows. Area B, Fig. 1.

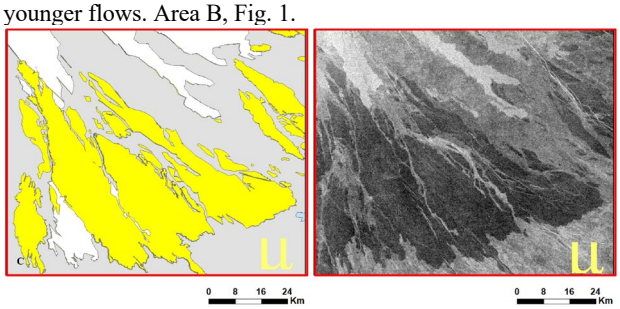

Fig. 4: Green (radar dark) flows are superposed on blue (radar bright flows). Area C, Fig. 1.

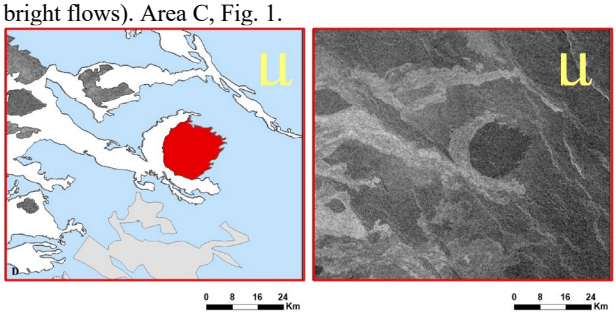

Fig. 5: White (radar white) flows surrounding the red (radar dark flows). Area D, Fig. 1

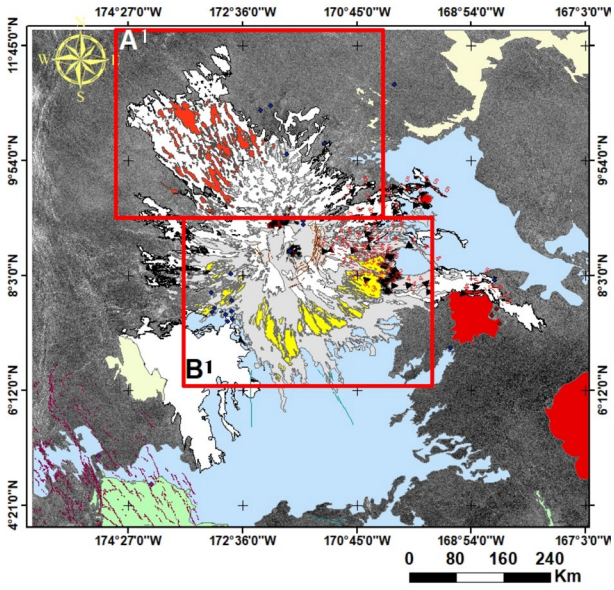

Figure 6: Map of Sapas Mons; showing location of Figs.A1, B1.

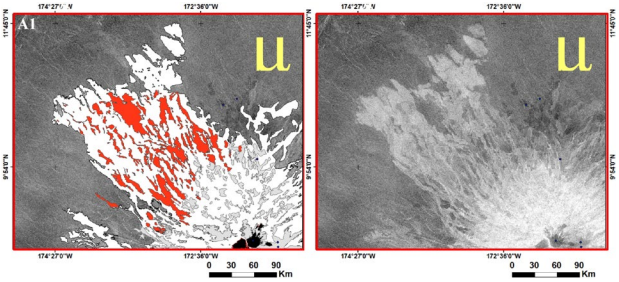

Fig. 7A1: Red color; old black flows coming from NMC; surrounded by younger white flows. The gray flow is also superposed by white flows.

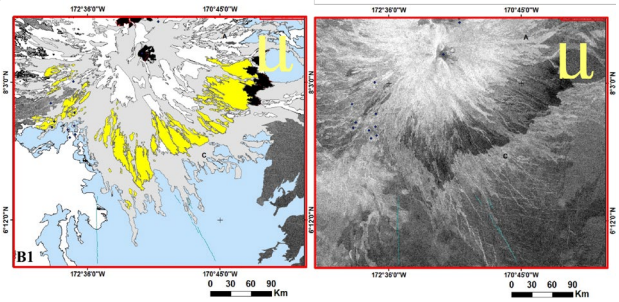

Fig. 7B1: At least five generations of lava flows classified from oldest to youngest one: as follows: blue lava flows emplaced before Sapas Mons, black flows followed by yellow flows, then by the white and sometime later gray lava flows. The color yellow represents black lava flows which probably came from SMC.