COMPARISION OF THE VOLUME OF RIFT-RELATED VOLCANIC ROCKS ON VENUS AND EARTH. Guseva E. N., Vernadsky Institute, 119991, Moscow, Russia, guseva-evgeniya@ya.ru

Introduction: Topographic rises on Venus are interpreted to be the regions of interaction of the mantle plums with the lithosphere. The Atla and Beta Regions are classified as rift-dominated topographic rises, domes [1]. The Atla Regio is associated with the dome that is about 1500 km across and 2 km high. The Beta Regio is spatially associated with the larger dome that is about 2500 km across and 2 km in high [2; 3]. The rift-dominated rises are characterized by extensive lava plains (pl) [4]. The large volcanoes from (1.5 to 6 km high and more than 100 km across, Maat Mons, Ozza Mons, Theia Mons) also characterize the rift zones of Atla and Beta [5; 6]. The model estimates of the thickness of the lithosphere for Beta Regio are ~ 300 км [7].

The Kenya-Ethiopian rift zones spatially associate with the topographic rises of Kenyan (~750 km across and ~1.4 km high) and Ethiopian (~1000 km across and ~1.4 km high) domes [3]. Both the Kenya rift and Ethiopian rift are characterized by the presence of extensive volcanic plains of the Pg-Q ages [8; 9]. The large volcanic constructs (Kenya, Kilimanjaro and Elgon, from ~4 to ~6 km high and to 60 km across) associate with Kenya-Ethiopian rifts [10; 11]. During formation of the rifts the lithosphere was thinned from ~ 100 km to ~ 40 km [12]. The thickness of the lithosphere in the East-African system at present is estimated to be from ~ 20-35 km to 55 km [9; 12; 13; 14].

Goals of study: The major goals of this work are as follows: 1) Compare volume of volcanic plains and constructs associated with rifts on Venus (Atla, Beta) and Earth (Kenya-Ethiopian region), 2) Correlate the results with the apparent thickness of the lithosphere.

Results: The rifts of Atla Regio (Ganis Chasma, Fig. 1) and Beta Regio (Asteria Regio, Fig. 2) demonstrate numerous lava flows from the rift fractures that form extensive lava plains. According to the literature data, the volume of the lava plains (pl, Fig. 1, 2) is estimated to be about 50×10^5 км^3 for Atla Regio and about 20×10^5 км^3 for Beta Regio, respectively [1].

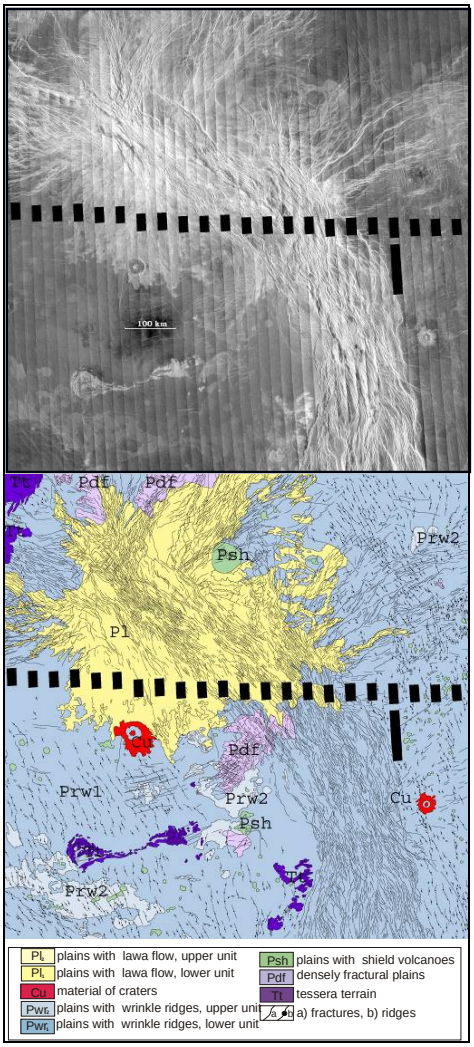

Fig. 1. Ganis Chasma (Atla Regio). Above – radar image CA "Magellan"; C1-MIDR, 15N197, below – photogeologic map.

The volumes of the large volcanoes (Maat and Ozza Montes) in Atla Regio are estimated to be about 2×10^5 км^3 and 3×10^5 км^3, respectively, and the volume of Theia Mons (Beta Regio) is about 2×10^5 км^3 [1].

The volume of lava plains at the Kenya rift (Fig. 3) is about 1×10^5 km^3 and the

volumes of volcanic constructs there is about 0.02×10^5 km^3 for the large volcanoes Kenya and Elgon and 0.04×10^5 km^3 for Kilimanjaro [8]. The total volume of lava plains at the Ethiopian rift is estimated to be about 3×10^5 km^3 [15].

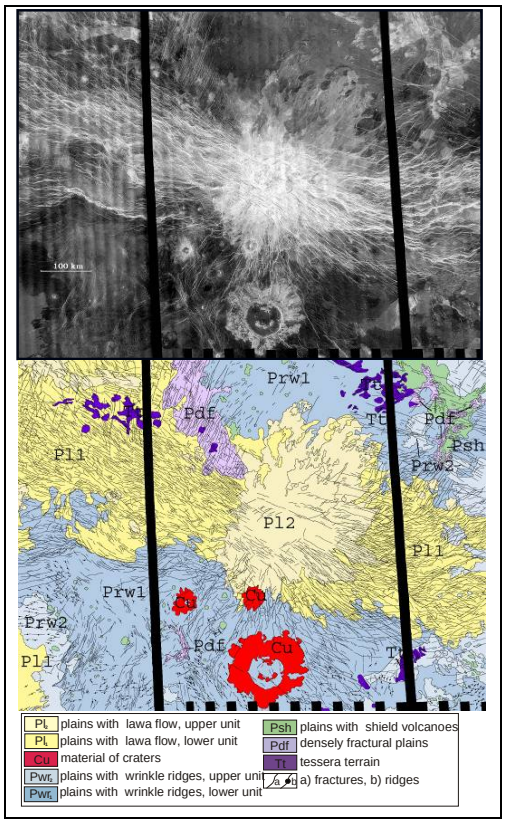

Fig. 2. Asteria Chasma (Beta Regio).
Above – radar image CA "Magellan", C1-MIDR, 15N266, below – photogeological map.

Summary: 1) The regions of Atla and Beta rifts have significantly larger volumes of volcanic materials comparing with the Kenya-Ethiopian rifts. The total volume of the lava plains and volcanic constructs for both Atla and Beta Regios (~77×10^5 км^3) is more than an order of magnitude larger than the total volume of volcanic materials in the region of the Kenya-Ethiopian rifts (~4×10^5 km^3). 2) If the rheological boundary layer (the lithosphere) on Venus were much thicker than on Earth, it would favor less voluminous volcanism on Venus. The apparently much larger volumes of volcanic materials on Venus are not consistent with this and may suggest that either (a) the lithosphere on Venus in fact is (at least) not thicker than that on Earth, or (b) the rift systems on Venus were active for a much longer period of time, or (c) the larger diapirs were responsible for the rifting and volcanism on Venus, or (d) all of these above. We are currently formulating a set of criteria to test these hypotheses.

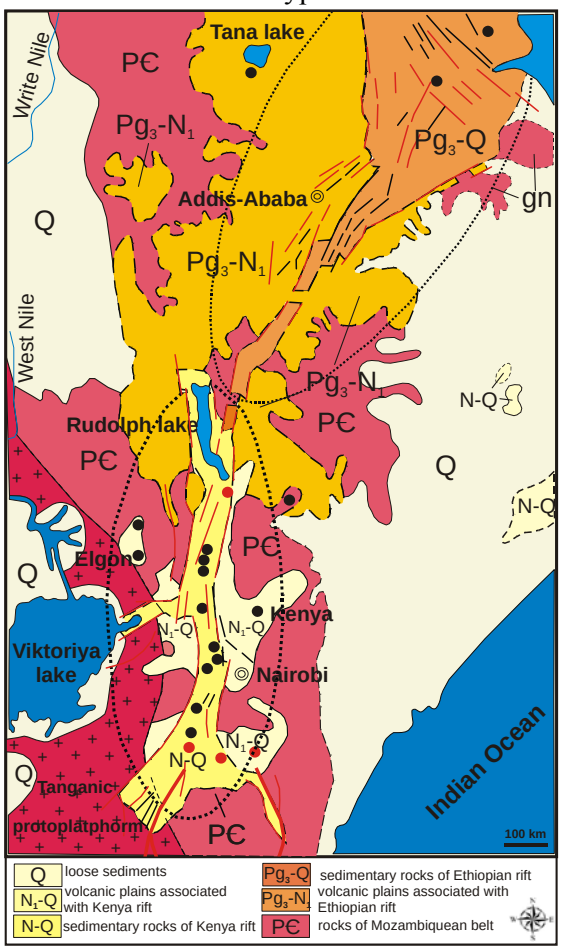

Fig. 3. Kenya-Ethiopian rift system by [8] with additions.

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