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DENSITY OF IMPACT CRATERS ON TESSERA, VENUS; M.A. Ivanov[1], A. T. Basilevsky[2]; 1) Vernadsky Institute, Moscow, 11975 Russia; 2) Brown University, Providence, RI 02912; permanent affiliation is with the Vernadsky Institute, Moscow, 117975 Russia.

Introduction. After the plains, tessera is the most abundant terrain on Venus. It occupies about 10% of Venus' surface, forming the continent-like blocks and small islands above the adjacent plains. Tessera is a result of tectonic deformations of some precursor terrain. However, the nature of that precursor, as well as the causes and mechanisms of its deformations, are under debate. Any models considering tessera terrain involve estimation of tessera age, either relative or absolute. It is well known that the important information on the age of a planetary surface comes from impact crater statistics. The Magellan global overview of Venus with improved resolution provides an opportunity to gather data on impact craters in amounts large enough for statistically reliable estimations of crater density for different terrains. Our study of impact crater density on tesserae compared to the surrounding terrains has a goal to determine whether it is higher, lower, or the same, and to interpret it in terms of the tessera age and processes involved.

Results. We have counted impact craters and measured their diameters using C1-MIDR images which have lower spatial resolution compared to F-MIDRs but have much more areal coverage. Because of the lower resolution of the images used, we have overlooked the amount of the smallest craters (a few km across). However, we checked our results with the crater catalogue of Schaber *et al.* [1] for which compilation of the full resolution imagery was used, and corrected our figures. We studied the images for a significant part of the surface between 30° S and 45° N. The area under study is about 230 million km^2 (about a half of Venus surface) and 11% of it (26 million km^2) is occupied by tessera terrain.

In our study, we distinguished only two categories of terrain: tessera and non-tessera. The latter includes many varieties of terrain such as plains, ridge belts, coronae and so on, but the majority of it is a volcanic plain, and in future considerations, we will refer to it as the plains. We present the results of our study in the form of a table:

Diameter	*Craters outside tessera*			*Craters inside tessera*		
interval, km	No.	Density	Standard	No.	Density	Standard
<16	206	1.00E-06	6.97E-08	15	5.77E-07	1.49E-07
16-128	170	8.26E-07	6.33E-08	29	1.11E-06	2.07E-07
32-128	53	2.57E-07	3.54E-08	12	4.62E-07	1.30E-07
>128	2	9.72E-09	6.87E-09	0	0	0

From the table it is evident that the density of small impact craters (D<16 km) on tessera is lower than on the plains while the density of large craters (D>16 km) on tessera is higher than on the plains.

Discussion. Higher density of larger craters on tesserae means that tesserae on the whole are older than the plains. If we assume that average crater retention age for a venusian surface (which practically means for the plains), is about 500 m.y. [1,2,3] and take into account the tessera and plain crater density error bars for 16-128 and 32-128 km size intervals, the crater retention age for tessera is estimated as 670 +365/-165 m.y. and 900 +430/-330 m.y. Following Schaber *et al.* [1] who used D>35 km crater subpopulation for estimating the age of the venusian surface, we favor the second of these estimations.

Lower density or deficit of small impact craters (D<16 km) for tesserae compared to their density on the plains, combined with the fact that for larger

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craters the density is higher, may be interpreted either as observational effect or, if this is not the case, as evidence that the smaller craters on tesserae were affected by some resurfacing which was significantly more efficient than the resurfacing on the plains.

The observational effect was the first thing we tried to check because it is obvious that it is more difficult to recognize craters on the rough surface of tessera than on the plains. But after comparing our data with the catalog [1] which had been compiled based on a special search for craters using full resolution imagery, we recognized that either we and [1] had overlooked a significant number of small craters on tessera, or both of us did not overlook them. So let us assume as a hypothesis that the deficit of craters on tessera is real.

If the hypothesis is correct, this means that a portion of the small craters on tesserae were destroyed by some process(es). Processes supposedly destroying craters are downslope mass wasting, aeolian erosion/deposition, volcanism, and tectonic deformations. To test all these possible causes of the deficit we have studied the morphology of the largest on-tessera craters, which we used for estimation of the tessera age. The logic of this study is: If there were some processes which destroyed a significant amount of craters from a few to 16 km in diameter, these processes also had to modify the bigger craters. We have studied these 12 craters, which vary in diameter from 36 to 85 km. Their morphology shows no evidence of significant downslope mass wasting or aeolian activity which might be considered a reason for the deficit of small craters on tessera. There is also no evidence of heavy volcanic flooding, which seems to exclude volcanism as a reason for the deficit. Tectonic deformation is seen only in two of twelve studied craters. The other ten craters show no evidence of tectonic deformation. So tectonic deformations also have to be ruled out as a reason for the small crater deficit. This forces us to return to the idea that both we and (4) could not recognize a significant amount of small craters on tessera terrain.

Conclusions. Our study has shown that for craters of 16-128 km and especially 32-128 km diameter size intervals, the on-tessera density is significantly higher than on the plains. If we use statistics for 32-128 km interval and assume that the average crater retention age for the plains is about 500 m.y., the average age for the tessera is estimated to be 900 +430/-330 m.y.

The density of craters < 16 km in diameter on tessera is significantly lower than on the plains. A study of the morphology of the largest on-tessera craters has shown that neither downslope mass wasting, aeolian activity, volcanism, nor tectonic deformations were the processes effective enough to significantly modify these large craters and therefore to destroy a significant amount of small ones. Therefore, the deficit of small craters on tessera is evidently an observational effect caused by difficulty in recognizing the small craters on rough terrain.

Absence of recognizable tectonic deformations in most of the large on-tessera craters means that during most of the accumulation time of the craters' subpopulation, most of the studied tesserae were tectonically stable and did not undergo gravitational spreading [4,5]. If this process was involved in the tessera formation it ceased before that time had come.

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