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Venus global relief map: compiling and results

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Abstract

Maps of the planets are widely used for solving important scientific tasks. They have been used for obtaining such quantitative indices as the areas of plains on the planets, sizes of large basins for revealing spatial regularities, as well analysis of the distribution of typical topographic forms in comparative planetology. The new Venus relief map on a scale 1:45M could be used for the different morphometric global relief investigations, for example for areas calculation, which different heights levels of the planets occupy. It can give the possibility to create the hypsographic curves, height histograms, profiles etc. And with using these curves and graphics it becomes possible to define some global relief parameters and features.

1. Introduction

In 2008 the Hypsometric map of Venus on a scale 1:90M had been prepared and published by Sternberg State Astronomical Institute (fig.1) [2]. Now the updated map of Venus on a scale 1:45M is prepared and published (fig.2).

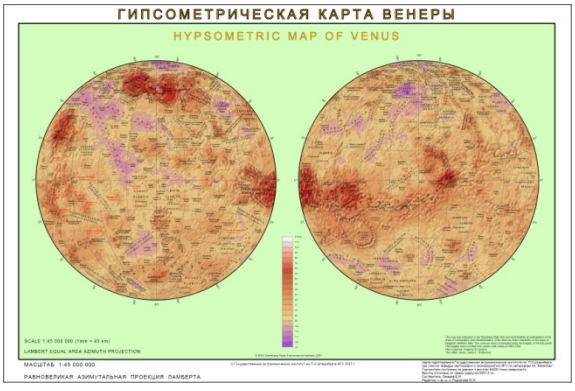

Figure 1: Hypsometric map of Venus, 1:90M, 2008.

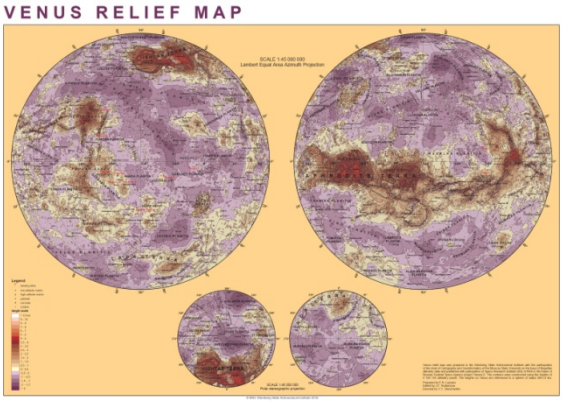

Figure 2: Venus relief map, 1:45M, 2010.

This map is distinguished by hemispheres original orientation, detailed relief representation for this scale, many features names and other important characteristics

2. Nearside and farside

Every 583 days Venus is positioned on lower conjunction relative to the Earth, i.e. when the planet is between the Earth and the Sun. In this position the hemisphere of Venus with the 320°E central longitude called nearside turns to the Earth [1]. Accordingly 140°E longitude is the central for the farside hemisphere. This situation will be observed at least 600 years. Based on these conditions 320° and 140°E longitudes are the central ones for the both hemispheres of the Venus relief map, compiled in the Sternberg State Astronomical Institute.

3. Map compiling

For map compiling the sphere with the radius 6051,8 km was used as a reference surface. The DTM consisted of more than 33 mln. points distributed regularly all along the Venus surface and compiled on the base of the NASA spacecraft *Magellan* radar (SAR) data was used as a source of height values. By averaging values from the source DTM 6 mln. points were obtained and used then for isolines creation

applying spline interpolation methods. After contours have been created the automated generalization was fulfilled. The area of the minimum closed contour on the map is equal 5 sq. mm. or 10 thousands sq. km. on the real surface. The Venus nearside and farside hemispheres relief map is compiled in Lambert equal area azimuth projection. The relief features names were taken from the Gazetteer of Planetary Nomenclature (http://planetarynames.wr.usgs.gov). The spacecrafts landing sites and height marks of some Venus relief structures were marked on the map too.

4. Global relief

Using this map it is possible to recognize the global relief structures of the planet, where the mountain regions make up 6,3% of the complete Venus surface, hilly plains 61,2%, and lowlands 32,5%.

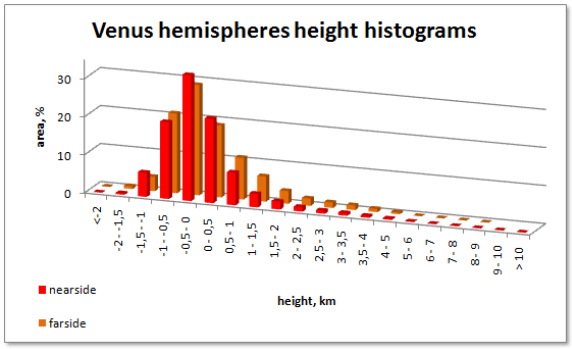

Figure 3: Venus hemispheres height histogram.

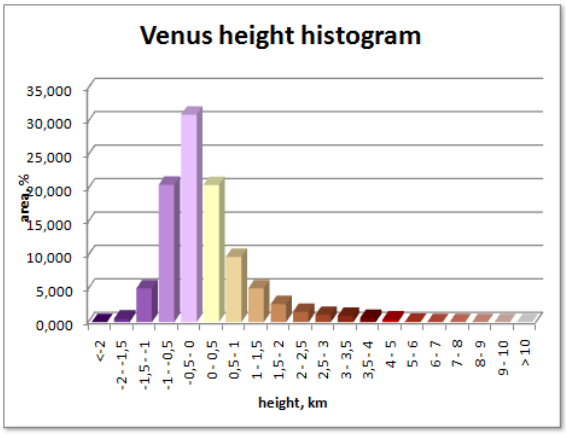

Figure 4: Venus height histogram.

Venus height histograms represent the global heights distribution for the both Venus hemispheres (fig.3) and the complete Venus surface (fig.4). The more detailed information about height levels areas is represented in Table 1.

Table 1: Venus heights distribution

HEIGHT	NEARSIDE		FARSIDE		VENUS	
km	ths.sq.km	%	ths.sq.km	%	ths.sq.km	%
<-2	12,3	0,005	31,0	0,014	43,3	0,009
-2 - -1,5	786,6	0,346	1617,8	0,706	2404,4	0,527
-1,5 - -1	14477,9	6,361	8588,8	3,750	23066,7	5,051
-1 - -0,5	45942,2	20,185	47953,5	20,936	93895,7	20,562
-0,5 - 0	75301,6	33,085	66397,7	28,989	141699,3	31,030
0 - 0,5	50437,0	22,160	43264,0	18,889	93701,0	20,519
0,5 - 1	19470,8	8,555	25052,8	10,938	44523,6	9,750
1 - 1,5	8037,4	3,531	15122,1	6,602	23159,5	5,072
1,5 - 2	4694,0	2,062	7635,4	3,334	12329,4	2,700
2 - 2,5	2624,2	1,153	4354,9	1,901	6979,2	1,528
2,5 - 3	1806,1	0,794	3220,1	1,406	5026,2	1,101
3 - 3,5	1603,6	0,705	2813,4	1,228	4417,0	0,967
3,5 - 4	1118,6	0,491	1881,9	0,822	3000,5	0,657
4 - 5	790,3	0,347	1040,4	0,454	1830,7	0,401
5 - 6	205,9	0,090	50,0	0,022	256,0	0,056
6 - 7	105,9	0,047	12,9	0,006	118,9	0,026
7 - 8	76,6	0,034	5,2	0,002	81,8	0,018
8 - 9	62,4	0,027	5,2	0,002	67,5	0,015
9 - 10	43,3	0,019			43,3	0,009
> 10	5,4	0,002			5,4	0,001

References

[1] Burba, G.: Cartographic aspects of Venus global geologic mapping at 1:10,000,000 scale, Vernadsky-Brown Microsymposium 24, October 1996, Moscow, Russia, 1996.

[2] Lazarev, E. and Rodionova, J.: Raster Venus and Lunar maps as a source for obtaining vector topographic data, The Second International Conference on Cartography and GIS, January 2008, Borovets, Bulgaria, 2008.