

AUTOMATIC CREATION OF THE HYSOMETRIC MAP OF VENUS. E. N. Lazarev^{1, 2}, J. F. Rodionova². ¹Moscow State University of Geodesy and Cartography, 4 Gorokhovskiy per., Moscow 105064, Russia, e-mail: zhecka@inbox.ru, ²Sternberg State Astronomical Institute, 13 Universitetskii pr., Moscow 119892, Russia, e-mail: jeanna@sai.msu.ru

Introduction: The new hypsometric map of Venus is compiled at Sternberg State Astronomical institute at a scale 1:45M. Detailed morphometric investigations of the planet were fulfilled too. At this moment there are no more exact and informative hypsometric maps of Earth group planets hemispheres. The most of small-scale general maps created by the last space researches have been compiled in the cylindrical projections (mostly in Mercator projection) [1]. It can pick out the small-scale maps in «Atlas of the Earth Group Planets and their satellites» creating in MIIGAiK [2]. The hypsometric map of Venus (1:45M) created under editing of Dr. Rodionova gives the representation of the planet relief on the basis of up-to-date data. The original level scale, named contours and names of relief forms in Latin and Russian are the advantages and merits of this map.

The process of map creation: The hypsometric map of Venus was created based on *Magellan* database consisted of three columns x, y and z. Z is the radius of Venus. The previous volume of this database is 33 million points [3]. Contours are drawn using points being situated away from each to other at 1°. For this aim the special program was written in the C++ program language. The automatic extract of points with this accuracy was fulfilled with the help of this program and the result was the database of 64 800 points. The coordinates and height information was the attribute of each point. The increase of points quantity was made in the areas of extreme values of heights (Maxwell Montes, Maat Mons, Atalanta Planitia) with the aim of improving precision.

Then the entire volume of points was divided by two hemispheres with the central meridians are 0° and 180°. And after that contours were constructed for each hemisphere. The construction of contours and work at all subsequent stages of map compilation were made with the help of software products Spatial Analyst v1.1, Arc/INFO v8.3 and ArcGIS v.9.0. Hypsometric map of Venus is compiled in Lambert equal area azimuth projection. The software products and the techniques of map creation are the same with the Martian and Lunar maps.

The contour line interval of this map is 0.5 km from -2 km to 4 km and it is 1 km for levels higher than 4 km. Such intervals are the most extensive for Venus hypsometric maps. The multicolored and lightened scale was chosen because such scales are the most expedient for the ridged mountain areas [4].

Then the contours generalization was fulfilled. The requirement was to preserve contour polygons

with the areas more than 10 000 sq. km at the Venus surface, which corresponded with areas approximately more than 5 sq. km at the map. Contours in the areas of extreme values of heights (Maxwell Montes, Maat Mons, Teya Mons, Atalanta Planitia, Leda Planitia, Polar areas etc.) are showed with exaggeration.

Parallels and meridians of the Venus coordinate network are made every 20° of latitude and longitude. The longitudes of Venus are measured from meridian of zero in the western direction from 0 to 360°. The Venusian meridian of zero intersect crater Ariadne in the North hemisphere.

The names of relief features are plotted at two languages. The places of spacecrafts landings and altimetric extreme meaning of some distinctive relief forms are placed on the map too with the relief features names.

The other side of Venus map has been prepared. It includes the descriptions of planet geologic structure and plotted relief features [5]. Graphs of morphometric investigations and photos of surface regions will be at the other side of the map as well.

Morphometric investigations: Created map of Venus allowed fulfilling morphometric investigations of the planet surface.

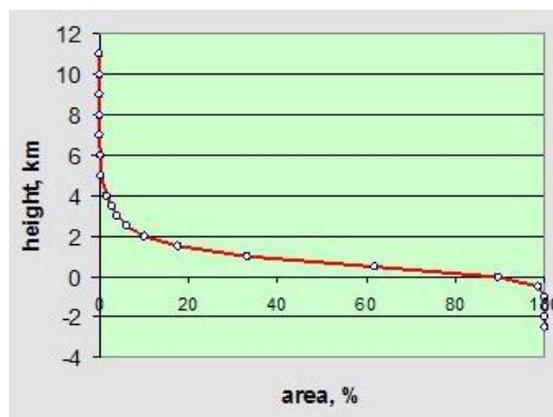


Figure 1. Hypsographic curve for Venus. Vertical axis shows the heights; horizontal – the fractional area occupied by surface of given height levels.

The hypsographic curve (figure 1) shows a maximum height of 11600 m (Maxwell Montes) and a minimum of -2500 (Leda Planitia). The curve lacks the step which occurs in the same curve for the Earth, Venus having a unimodal peak of heights between 0 and 1 km while the Earth has a bimodal peak (21% between 0 and 1 km, 23% between -4 and -5 km). The range of heights on Venus is 14 km compared to 20 km on Earth.

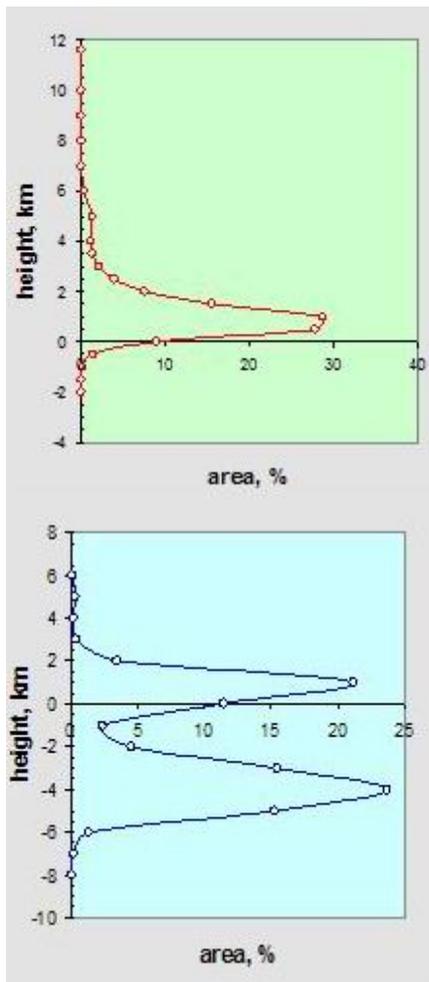


Figure 2. Surface height histograms for both Venus and Earth.

Surface height histograms for both Venus and Earth are shown in figure 2, where the areas are shown as percentages of the total: 455.6 Mkm² for Venus and 511.2 Mkm² for Earth. For Venus, besides the main peak, a small peak can be seen between 4 and 5 km, representing the highland plains. Within Ishtar Terra these are Lakshmi Planum and the region to the east of Maxwell Montes, as well as the western part of Aphrodite Terra. The mountainous regions (from 2 to 11.6 km) make up 10.1% of the surface, hilly plains (from 0 to 2 km) 79.5%, and lowlands (below 0 km) 10.4%. According to previous investigations by Pioneer Venus [6, 7] the mountainous regions made up 7.4% of the Venus surface, hilly plains 65.4%, and lowlands 27.2%.

The areas of different height levels and relief features (table 1) were counted and different height profiles were also created for Venus.

Table 1

Relief feature	Area, mkm ²	Extreme height, km	Zero level, km
Aphrodite Terra	30.61	5.80	1.00
Ishtar Terra	13.15	11.60	1.00
Alpha Regio	1.52	2.90	1.00
Beta Regio	5.44	5.80	1.00
Atalanta Planitia	5.53	-1.30	0.00
Guinevere Planitia	14.52	-0.95	0.50
Helen Planitia	7.00	-0.75	0.50
Lavinia Planitia	5.73	-0.60	0.50
Niobe Planitia	7.71	-0.70	0.50
Sedna Planitia	10.26	-0.80	0.50

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