SIZE DISTRIBUTIONS OF MARTIAN CRATERS. L. Syzyakova[1] , N. I. Perov[2], [1,2]Astronomical Observatory, State Pedagogical University, Respublikanskaya, 108. Yaroslavl-150000. Russia. E-mail: perov@yspu.yar.ru

Introduction: There are majority empirical models of distributions of planetary and satellites craters, on different parameters [1], [2]. Usually the authors use polynomial, normal, lognormal and bimodal distributions [3]. For example it is usually supposed the impact craters have power law of size distributions. But this model often leads to incorrect results and in such situation pay attention to multiinclinations of corresponding curves, breaking up the experimental curves into several parts, each of them is approximated to the power law with different indexes. Moreover cosmic apparatus have produced new facts needed for their adequate description of "universal' distribution. Functions which are not traditionally presented Martian structures size distributions have to a) be applied to finite and infinite distributions; b) approximate with high precision observations in the region of small diameters and about points contrary flexure; c) turn asymptotically into by standard power law at the large meaning of the diameters.

The Modeling of Martian Craters Size Distribution: The function (1) satisfies the above demands.

$$N(D)/N_0=aD^b(\exp(cD^d)+f)^g, \qquad (1)$$

where N(D) is a number of craters on interval from D to D+ΔD, N_0 is a total number of craters in the statistics. In order to determinate the values of *a, b, c, d, f, g* by numerical way and estimate the errors of the statistics we use the least squares method and criterion of Fisher [4]. In two examples below we put N_0=935 in accordance with [5]. (Though the known total number of Martian impact crates is exceed 42283 [6]).

Example 1: In the region of diameters from 1 km to 70 km there are 707 Martian craters (in [5]). Using 7 intervals with step by 10 km we found the parameters of this finite distribution (if D<2144 km): $\ln a$=5.2799, b=-2.0368, c=35.1398, d=-0.6729, f=-1.2231, g=-0.2642. Index of the correlation R_{ND}=0.986, the dispersion S=0.151 and the criterion of Fisher-Snedecor F=7.18. In the table [4] $F_{0.5;5;1}$=1.89. So, the distribution (1), with the calculated accuracy, is signified.

It should be noted 1) the corresponding determinant of the linear system of equations after last iteration equals 0.000063. 2) If

$$\exp(cD^d)+f>0, \text{ for all } D, \qquad (2)$$

then maximal value of diameter of impact craters is equal to 2144 km (in the given model -1).

Example 2: In the region of diameters from 1 km to 260 km there are 935 Martian craters (in [5]). Using 26 intervals with step by 10 km we found the parameters of this (in fact infinite) distribution (if D<2390 km): $\ln a$=2.4869, b=-1.4922, c=4.2909, d=-0,2453 f=-1.8898, g=-0.8886·10^{-12}. Index of correlation R_{ND}=0.9, dispersion S=0.583 and criterion of Fisher-Snedecor F=17.09. In the table [4] $F_{0.001;5;20}$=6.46. So, the distribution (1), with the calculated accuracy, is signified. In this case in fact we have power law of size distribution of Martian craters.

It should be noted 1) the corresponding determinant of the linear system of equations after last iteration equals 0.2288·10^{-18}. 2) For condition (2) the maximal value of diameter of impact craters is equal to 2390 km (in the given model - 2).

Conclusion: It is obviously the distribution (1) is generalized the well-known statistics of Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein. The applications of the considered distribution to investigate of real Martian structures give new scientific results.

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