

# The fractal analysis of the gravitational field and topography of the Mars

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## Abstract

The aim of this paper is to represent the results of a structured fractal analysis of gravitational and topographical parameters of Mars on the basis of data obtained from the space missions. To analyze Martian fractal structures the observations from the data received from boards of the space missions including «Mars Global Surveyor» has been used. The models of relief and Mars gravitational field have been constructed on the basis of harmonic analysis of the expansion in spherical functions of the satellite observations data. As a result, fractal dimensions of Martian reliefs anomalies and Mars gravitational potential by longitude and latitude have been determined. Mean values of the fractal dimensions  $D$  have been obtained as well: mean fractal dimensions of Martian topographic model by latitude  $D = 0.86$ , by longitude  $D = 0.88$ ; mean fractal dimensions of Martian gravitational potential anomalies by latitude  $D = 1.06$ , by longitude  $D = 1.092$ .

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## References

- [1] Demin S A, Panishev O Y and Nefedyev Y A 2014 Kinematics and Physics of Celestial Bodies 30 63
- [2] Demin S A, Panishev O Y and Nefedyev Y A 2014 Nonlinear Phenomena in Complex Systems 17 177
- [3] Turcotte D L 1987 Journal of Geophysical Research 92 597
- [4] Stepinski T F, Collier M L, McGovern P J and Clifford S M 2004 Journal of Geophysical Research: Planets 109 E02005-1
- [5] Nefedyev Y A, Bezmenov V M, Demin S A, Andreev A O and Demina N Y 2016 Nonlinear Phenomena in Complex Systems 19 102
- [6] Sokolova M, Kondratyeva E and Nefedyev Y 2013 Advances in Space Research 52 1217
- [7] Nefedjev Y A and Rizvanov N G 2002 Astronomische Nachrichten 323 135
- [8] Nefedyev Y, Valeev S, Mikeev R, Varaksina N and Andreev A 2012 Advances in Space Research 50 1564
- [9] Zhikov VV 1996 Soros Educational Journal 12 109
- [10] Genova A, Goossens S, Lemoine F G, Mazarico E, Neumann G A, Smith D E and Zuber M T 2016 Icarus 272 228
- [11] Shan J, Yoon J S, Lee D S, Kirk R L, Neumann G A and Acton C H 2005 Photogrammetric Engineering and Remote Sensing 71 97
- [12] Ferguson B B, Cain J C, Crider D H, Brain D A and Harnett E M 2005 Geophysical Research Letters 32 L16105-1
- [13] Andreev A O, Demina N Y, Demin S A, Nefedyev Y A and Churkin K O 2016 Nonlinear Phenomena in Complex Systems 19 271
- [14] Rizvanov N G, Nefed'ev Y A and Kibardina M I 2007 Solar System Research 41 140
- [15] Busarev V V, Shevchenko V V and Surdin V G 2007 Model of the Cosmos ed M I Panasyuk (Moscow: KDU) The physical conditions near the Moon and planets of the Solar System 794-861
- [16] Panishev O Y, Demin S A and Rusanova I A 2015 Biomedical Engineering 49 236