MERCURY TOPOGRAPHIC ROUGHNESS: CALCULATION, ANALYSIS, MAPPING

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Roughness is one of important surface characteristics, which shows relative height variation. It can be defined differently depending on which calculation method is used. In previous studies [1] we calculated global Mercury topographic roughness as interquartile range of the Laplacian second derivative by means of specially developed GIS toolkit [2]. This method was developed and tested earlier on the example of the Moon [3] and Mars [4].

In this study we have used another technique – relative topographic position [5]. By this method topographic position of each pixel is identified with respect to its local neighbourhood. Moreover, we have carried out comparative analysis of these two methods. The results are used to develop a morphological classification for a new global Mercury cartography, including interactive web-maps of topographic roughness.

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**References:**

[1] Zharkova A.Y., Karachevtseva I.P., Zubarev A.E., Brusnikin E.S., Kokhanov A.A., Kreslavsky M.A. The study of Mercury’s surface by cartography methods based on the newest topographic data derived from MESSENGER image processing // Sovremennye Problemy Distantsionnogo Zondirovaniya Zemli iz Kosmosa (Current problems in remote sensing of the Earth from space), 2016, V. 13, No. 5, pp. 265-274, <http://d33.infospace.ru/d33_conf/sb2016t5/265-274.pdf>.

[2] Kokhanov A.A., Bystrov A.Y., Kreslavsky M.A., Matveev E.V., Karachevtseva I.P. Automation of morphometric measurements for planetary surface analysis and cartography // In Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., 2016, XLI-B4, pp. 431-433, doi: 10.5194/isprsarchives-XLI-B4-431-2016.

[3] Kokhanov А.А., Kreslavskiy М.А., Karachevtseva I.P., Matveev E.N. Mapping of the statistical characteristics of the lunar relief on the basis of the global digital elevation model GLD-100 // Sovremennye Problemy Distantsionnogo Zondirovaniya Zemli iz Kosmosa (Current problems in remote sensing of the Earth from space), 2013, V. 10, No. 4, pp. 136-153, <http://d33.infospace.ru/d33_conf/sb2013t4/136-153.pdf>.

[4] Kreslavsky M.A., Head J.W. Kilometer-scale roughness of Mars: Results from MOLA data analysis // Journal of Geophysical Research, 2000, V. 105, pp. 26695-26712, doi: 10.1029/2000JE001259.

[5] Jenness J. Topographic Position Index (TPI) v 1.2. Extension for ArcView 3x // Jenness Enterprices, 2006, <http://www.jennessent.com/arcview/tpi.htm>.