ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The Evaluation of the Geometric Assessment of the Surface of the Ore Body.

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ABSTRACT

A study evaluating the geometric variability of the surface of the ore body, including the problem of the problem of analytical description of the geological surface becomes more economic importance as an intense tightening of modern production and market quality requirements of subsoil use. The given paper describes the evaluation and geometric assessment of the surface of the ore body.
Keywords: ore, surface, assessment, geometry, criteria, investigation, quality

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ISSN: 0975-8585

INTRODUCTION

The studying of an assessment of geometrical variability of the surface of the ore body, including problem tasks of the analytical description of a geological surface, is being gained more important economic value in process of intensive toughening of the modern production and market demands to quality of production of subsurface use.

This large complex problem includes the complex of tasks, determination of parameters of separation of contact kinds of the mountain mass and providing an optimality of level of quantitative and high-quality losses, the description of distribution and communications of structural parameters are basic of which an assessment of reliability of calculation of stocks, and also forms a basis of the solution of problems of justification of mining technological processes of working off of difficult extraction sites of the ore bodies.

The structural components of indicators of near the contact zones of ore bodies are studied by many authors. It is known that system " near the contact zone" can be presented by its partition on the top, average and lower levels of formation, i.e. on subsystems – " near the contact zones on the reconnoitered ore bodies", " near the contact zones on design contours of ore bodies" and " near the contact zones of the ore bodies ready to dredging". According to hierarchy levels: it is advisable to call these three subsystems as prospecting, design and extraction near the contact zone s in which are respectively inherent geometricity, parametricity and an informative of systemic contours. These zones as difficult and complex subsystems, possess the corresponding microstructure, and according to them concrete parametrical series are inherent. In particular, concepts are widespread: near the contact zone, contact uncertainty near the contact zone "ore breed", the contact near the planimetric strip, a zone of contact uncertainty, geological and technological surfaces, amplitude of a deviation or evasion of a geological surface from technological or width of near the planimetric strip, different average values, etc.

The general structure of near the contact zones – zones of hashing of kinds of mountain mass at production, includes the following parametrical series: 1) near the contact zones strip and zone of contact uncertainty, contact "ore breed"; 2) power of near the contact zones; 3) geological surface; 4) technological surface; 5)near the planimetric and out planimetric subbands; 6) roughness near the contact – elementary microprominences; 7) width of near the contact of roughness; 8) height of near the contact of roughness; 9) the average statistical near the contact parameters of zones of ore ph. arithmetic-mean value, a median surface, a mean square deviation (standard), an average on the first differences, height (amplitude) of near the contact of roughnesses; variation, step and frequency of diffusion of roughnesses of a surface of contact.

The analysis of the above-stated parametrical components of near the contact of a zone allows to conclude that structure-forming and predetermining the importance of extraction unit of mine geometrical feature – variabilities of a surface of the ore body concerning the smoothed form is main. Therefore this problem mining geometrical task was studied by many researchers, as proves to importance of this task in the sphere of development of a subsoil.

The principle of epy comparison of geometry of the geological surface of deposits of its rather correct smoothed form is the basis for an assessment of variability in many works. Below works on geological geometrical estimates of geometry of contacts of ores and the containing breeds are being allocated.

The method of the geometrical assessment of variability of an indicator of a field in which basis the principle of the accounting of geometry of spatial placement of an indicator is underlain widespread and allows to express quantitatively average variability of an indicator on this interval [1,2]. The formula of the determination of the coefficient of variability of an indicator expressing nature of variability and its intensity is being offered.

$$u = \frac{S_{(k)} dk}{L} - 1, \qquad (1)$$

where $S_{(k)}dk$ - the curvilinear integral of the first type is taken on curve k in the set interval (curve length); L – a hypotenuse of a rectangular triangle with the legs peer to length of a projection of a curve and scope (curve projection length), m.

For example, variability of the closed contours

$$u = \frac{L}{L_0} - 1 = \frac{1}{3.54\sqrt{S_0}} - 1, \qquad (2)$$

where S_0, L_0 - the area and length of a circle.

A.G. minnows/3/are offered by determination of variability through geometrical correlation of a surface on formulas:

$$\begin{cases} R = \cos\varphi \\ R^2 = \dfrac{1}{1-q^2} \end{cases} \qquad (3)$$

where $R = \cos\varphi$- measure of geometrical correlation; φ- angle between two vectors $\vec{A}$ и $\vec{B}$; q- the gradient vector defining the geometrical element of a surface.

In work [4] degree of variability of contacts of ore bodies ($\frac{t}{r}$)is offered to be estimated through the wave amplitude relation (or other, related size) to a wavelength. Here it is considered to be that variability of contacts has wavy character.

The indicator of variability of a contour of ore bodies is presented in the form of various the planimetric models designed on the basis of comparison of perimeter of the actual ore body ($l_{\hat{o}}$)with a length of a circle of an equal circle [5], with perimeter of an equal rectangle [6] and with perimeter of an ellipse [7]. In work [7] correctly it becomes perceptible that the variability indicators offered by authors of works [5,6] consider degree of elongation and complexity of configurations of the actual contours of ore bodies insufficiently.

Thus Kuzmin V. I. [7] suggests the planimetric module to determine by a formula:

$$\mu = \frac{l_{\hat{o}}}{l_{\acute{y}\ddot{e}}} = \frac{l_{\hat{o}}}{4{,}7\grave{a} + 1{,}5\dfrac{S_{\hat{o}}}{\grave{a}} - 1{,}77\sqrt{S_{\hat{o}}}}, \qquad (4)$$

where $S_{\hat{o}}$ - the area of the actual contour, м^2; *a* – half of length (greatest size) of a figure of a contour, m.

Ways of an assessment of roughnesses of surfaces of details of mechanisms where as criteria of an assessment of roughnesses of surfaces indicators – the average arithmetic height and an average quadratic deviation of roughnesses from a surface are offered are given in works [8-11]. In addition to these criteria for the characteristic of a configuration of a roughness taking into account not only heights of roughnesses, but also quantities of crests, the indicator suggests to use [10]

$$k_i = \frac{B}{L}, \qquad (5)$$

where B – roughness profile basis length; L – surface profile length.

Authors of works [11,12], on the basis of the analysis of the known formulas of an assessment of variability expressed through mean square deviations and by means of the first and second differences open their physical sense. Thus it is brought that the arithmetic sum of the first differences in fact estimates the sum of amplitudes of the fluctuations opened with this network. Mark out statistical variability when for an assessment the periods of fluctuations of properties are attracted. It is specified that size with augmentation of l increases under the linear law in a look $\overline{\Delta'}$ =*bl*.

Kalinchenko V. M. [13] gives justification that empirical coefficients (and, b) in the empirical equations of regression (y=a+bx) make physical sense as the characteristic of the general pattern inherent in this placement of property, i.e.

$$b = \frac{1}{L}\sum |\Delta_l''|_{\max}, \quad (6)$$

where b – geometrical indicator of variability; L –length of a section, m.

Thus *a*=const estimates variability at casual placement of properties, and a combination *a* and b – at composite placement. Geometrical sense of coefficient b, inclination peer to tangent of angle α inclination peer to tangent of angle y=f(x), is explained by that this size is as if the characteristic of coolness of this curve.

The existing ways of a quantitative assessment of variability of diffusion of geosigns developed by various authors in different years are given in table 1.

CONCLUSIONS

1. The geometrical feature – variability of a geological surface of an ore body of a field is one of quality of the reducing parameters indicators, influence which often happens very essential at production.
2. Many authors recognize that ways of an assessment of variability and the removed formulas on them are similar according to the content of geometrical representations.
3. The main disadvantage to widespread ways and geometrical indicators of variability, based on the first consecutive differences, it is necessary to carry not an accountability of degree of irregularities of a locating of points and not uniformity of geometry of placement of property as they are brought out of the consecutive differences assuming practical uniformity of these parameters.
4. The main disadvantage to widespread ways and geometrical indicators of variability, based on the first consecutive differences, it is necessary to carry not an accountability of degree of irregularities of a locating of points and not uniformity of geometry of placement of property as they are brought out of the consecutive differences assuming practical uniformity of these parameters.
5. The methods of an assessment of variability of a sign based on detection of nature of change of a sign (waviness, linearity, a zig-zag, the correct geometricity, etc.) in which irredeemable indicators, in the concrete direction of shift of an ore body are used. Are similar, and the general principle of their structuring is object, allowing to tap geometrical nature of variability of a sign.

Table 1: The ways of a quantitative assessment of variability of epy geosigns recommended by various authors

The offered ways of a quantitative assessment of absolute variability of signs							
The ways – through mean square deviations (σ)		The ways – through consecutive differences (Δ)		The ways – through geometrical characteristics		The ways – through the combined characteristics	
1	σ= $\sqrt{\frac{\sum(\tilde{o}-\bar{\tilde{o}})^2}{n}}$; (The method of a statistical assessment)	1	$C_0 = \frac{\sum \Delta_1}{L(n-1)}$; (P. A. Protodiyakonov, 1929.)	1	$\grave{E}_{K-1} = -\frac{\int_{(K)} dk}{D} - 1$; (Bukrinsky V.A., 1965.)	1	НП= $\frac{P_{\max}}{P}$; (Bagatskaya VV, 1963)
2	σ= $\frac{1}{2^m}\sqrt{\frac{\sum \lvert\Delta_m^2\rvert}{N-m}}$; (P.P. Bastan, 1963)	2	$J^{II} = \frac{\sum \lvert\Delta_I\rvert}{L}$; (A.S. Vlasov, 1958)	2	$\varphi_{P.T} = 0{,}5(1+\varphi_K)\frac{m_{n3}}{M_{P.T}}$, $\varphi_K = \exp(KV_{np}) - 1$; (Kurmankozhaev A., 1978)	2	$V = \frac{\sum(Y_m - Y_{n-1})}{2\sum Y_n - (Y_1 - Y_n)}$; (I.P. Sharapov, 1952)

3	$P_{ñê/ïð} = \sqrt{\frac{\sum\|\Delta_2\|}{\sigma * Ï}}$; (Popov E.I., 1959)	3	$M = \frac{\sum\|\Delta_2\|}{K}$; (Kazakovsky D. A., 1948)	3	$\mu = \frac{l_\phi}{4,7a + 1,5\frac{S_\phi}{a} - 1,7\sqrt{3\phi}}$; (Kuzmin V. I., 1967)	3	$\varphi(P) = \varphi^I(P) + \phi(P)$; (Azbel E.A., 1985)
4	σ= $\sqrt{\frac{\sum(\tilde{o} - \tilde{o}_{çàê})^2}{n}}$; (Kalistov P. L., 1956)	4	$l_a = \frac{\sum\|\Delta_2\|}{nl^2}$; (Kel N. G., 1969)	4	$R = \cos\varphi, a^2 = \frac{1}{1+q^2}$; (Galyanov A.G., 1970)	4	$W = \lambda\left(\frac{x}{y}\right) * \ln\Omega\left(\frac{x}{y}\right)$; (Kurmankozhayev A., 1991)
5	$\sigma_{\Delta l} = \sigma_h\sqrt{\frac{\Delta V}{V}}$; (Gudkov, V., 1969)	5	$\theta = \frac{\sum\|\Delta_2\|}{Kl''}$; (Nizguretsky Z.D., 1971)	5	$Z = \frac{\frac{1}{2(n-1)}\sum_{i=1}^{n-1}(h_{i+1} - h_i)^2}{\frac{1}{m-1}\sum(h_i - \bar{h})^2}$; (Linnik Yu.V. etc., 1958)	5	$S(\omega) = \frac{\sigma^2 * a}{\pi(a^2 + \omega^2)}$; (Busalayev I.V., 1960)
6	$m_H = \sqrt{\frac{1}{K} * \sum_{i=1}^{K}(H_i - H_t^1)^2}$; (Boyko A.V., 1980)	6	$K_M = \frac{\sum\Delta_{1m}}{M\sum l}$; (Porokin S. A., 1961)	6	$R_M = \frac{A_0}{1 + \hat{a}_{1,0}M * 10^{-3}\exp\left(-\frac{2500}{M}\right)}$, $g = \frac{R_0}{R_M}$; (Neumyvakin Yu.K., 1967)	6	$R_K = N_{0,x} * \log_2 * \ln q$, $R_l = N_{0,x} * \log_2 * \ln q_0$; (Neumyvakin Yu.K., 1976)
		7	$\varphi = \left\{\frac{1}{n-2}\sum_{i=1}^{n-2}\sqrt{\|\Delta_2\|}\right\}^2$; (Borovko A.N., 1971)			7	$H_K = \sum_{i=-l/2}^{l/2} l_2 * h_{K-1}$; (Devdariani A.S., 1966)

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ISSN: 0975-8585

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