ASSESSMENT OF THE INFLUENCE OF CONTACT CHARACTERISTICS ON THE STRESS-STRAIN STATE OF THE MODELED DISTURBED ROCK MASSIF

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One of the important geological factors influencing the stress-strain state of the deposits under development is different structural heterogeneities. This fact requires their appropriate account when forecasting geomechanical conditions during deposit development.

Finite-element models can simulate large fault structures by filling them with a composite substitute material with reduced strength (deformation) characteristics. Such a representation provides sufficient modeling reliability at the deposit's model level. More detailed modeling, such as the study of an individual deposit's block, requires considering the contact characteristics at the block boundary.

The influence of interblock interfaces in the finite-element method can be accounted for by using the contact elements and their modifications proposed by R. Goodman. These elements are characterized by normal and tangential stiffness. The presented numerical tests were aimed to estimate the change in the stress field of the hosting rock massif and the fault structure itself during the implantation of contact elements along the boundary of structural heterogeneity.

The modeling results of the stress-strain state of the Kukisvumchorr deposit's block with a characteristic vertical fault cutting the ore deposit were chosen as initial stress-strain state. The deposit is located in the tectonically stressed Khibiny rock massif. Therefore, the maximum component of the principal stresses has a subhorizontal direction and acts in a near-normal mode to the fault plane. The fault structure and the hosting rock massif are characterized by the following deformation parameters:

- Hosting rock massif: E = 70000 MPa and $\nu = 0.2$
- Ore body: E = 40000 MPa and $\nu = 0.35$
- Fault structure: E=7000 MPa and $\nu = 0.3$

The approximate values of 2,000 MPa/m and 1,000 MPa/m, respectively, were taken as initial normal and tangential stiffness [1]. A total of twelve model variants with variation of contact stiffness and deformation characteristics of the blocks within the range (2*104÷7*106MPa/m) were calculated. Analysis of the results made it possible to conclude:

- In the case when the filling material of the fault structure is similar in properties to the hosting rock massif, the implantation of contact elements on its surface has a greater effect on the stress field in the massif itself.

- When contact elements are implanted on the surface of the fault structure containing more weakened rocks, the ranking of the normal and tangential stiffness (even within two orders of magnitude) has no special effect on the stress field of the hosting rock massif.

- When contact elements are implanted on the surface of the fault structure, the values of the maximum component in the fault structure itself undergo more significant changes. This effect becomes less noticeable when the strength characteristics of the fault structure decrease.

Authors intend to continue numerical tests with a different orientation of maximum compression in relation to the fault structure.

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1. Kostyuchenko V.N., Kocharyan G.G., Pavlov D.V. Strain characteristics of interblock gaps of different scales // Physical Mesomechanic – 2002. –V.5. - № 5. - Pp. 23-42