Estimating the location of faults based on the distribution of joints using Fisher's constant coefficient (K)

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English Extended Abstract

Summary

The system of joints, as homogeneous statistical collections limited to large tectonic structures, are the best indicators for separating these areas. According to the evidence, the orientation of the joint system is disrupted near the tectonic structures. This issue was considered as the hypothesis of this study and Fisher coefficient was used as the main factor in the diagnosis of the joint system. In order to validate the hypothesis, using geometrical data of discontinuities taken from four mines, the distribution of K coefficient was achieved in these mines. Thus, areas with high concentration of K coefficient in each mine were determined as the cross points of the faults.

Introduction

Discontinuities are the most important factor in the disorder and the impossibility of achieving ideal conditions. Sometimes in geomechanical study areas, joint studies are performed before tectonic studies. The reason is the lack of necessary outcrops to identify the tectonics of the area or uncertainties in their location. Therefore, the problem is to find a solution to estimate the position of large-scale structures, especially faults. From this perspective, in previous research, several points have been proposed to identify such structures:

1. Joint density usually increases in areas near the faults.
2. The distribution of discontinuity dip and dip direction, near the faults is generally severe.
3. Alteration and weathering are high in the areas around the faults.

Methodology and Approaches

In this study, increasing the distribution of discontinuity dip and dip direction and its relationship with the location of large tectonic structures has been used as a hypothesis. The Fisher coefficient (K) represents the scatter of the Fisher variable distribution function. Logically, in tectonized regions and fault zones (fault crossing areas), the distribution of the dip and dip direction of the joints is higher. As a result, the Fisher constant (K) decreases at the fault crossing point and increases at the inter fault zone. Based on this feature, areas with more tectonic mobility can be separated from structural calm areas and the Fisher's constant coefficient is introduced as a parameter determining the order of discontinuities.

Results and Conclusions

By taking primary data, including the dip and dip direction of the discontinuities from the four mines of Sechahoon, Ghoghart, Meiduk, and Esfordi phosphates, the distribution of K coefficient and drawing the contour lines based on the Fisher coefficient, the fault system in the study area was identified. Thus, areas with a high concentration of K coefficient in each mine were considered as fault crossings. By comparing the tectonic blocks enclosed between the faults of each mine and its relative compatibility with the separated areas by the proposed method, the efficiency of this method to identify the joint system and estimate the position of large tectonic structures was well achieved.