EVALUATION OF GEOCHEMICAL ANOMALIES IN KERVER DEPOSIT

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Abstract: Evaluation of zone dispersed mineralization from blind mineralizations in active and inactive mines are the main challenges in mining geochemistry. In the past years, Different quantitative models have been presented for different types of mineralization using zonality traditional method. These methods have different disadvantages. In this research, a new model have been presented for detection of anomaly by integration of singularity and zonality methods in Baggolom (in Jebal- Barez region), then the obtained results were compared with results of zonality and fractal methods. 400 rock samples were taken from the studied area, and analyzed for Cu, Zn, Ag, Pb, Au, W, As, Hg, Ba, Bi with emission spectrometry. According to the zonality method if Pb*Zn/Cu*Ag>10, the anomaly is a blind mineralization. This method shows the depletion and enrichment of vertical zonality index in the area. The singularity of vertical zonality index (Pb*Zn/Cu*Ag) was mapped. Results showed that the northern part of this area is a blind mineralization and the copper anomaly in the center and southwest of the area is a zone dispersed mineralization. These results are in good agreement with the zonality method and previous researches in this area. The fractal method with the zonality index threshold of 398 showed the same results. This method do not need to access the database of copper porphyry deposits or comparison with other similar deposits.

Keywords: Singularity, Zonality index, Blind mineralization.

1- INTRODUCTION

Successive non-linear processes generating frequency distributions with Pareto tails may be related causally such as rainfall and flooding. The total amount of ore and metals in hydrothermal ore deposits often have Pareto tails (Cheng, 2006). Many researches were done for detection of weak anomalies with geophysical (Chen et al., 2015) and geochemical data (Zuo et al., 2013 ، Shuguang et al., 2015, Chen and Cheng, 2016). In this paper detection of blind mineralization was done by integration of singularity and zonality methods for the first time in Kerver that located in Jebal- Barez zone.

2- METHODS

Local anomalies of the sub-ore and supra-ore elements were detected in the studied area. Vertical zonality indexes were calculated using area productivity and mineralization coefficients in these local anomalies.

The concept of productivity has a particular application where multiple samples and anomalies are present in the area. The productivity was calculated using Equation 1 and 2 (Solovov, 1987).

$$M = \Delta x(\sum_{x=1}^{n} C_x - nC_0) \quad (1)$$

$$P = 2L * \sum_{i=0}^{m} M_i \quad (2)$$

In which:
p : areal productivity
M : linear productivity
C_0 :the background concentration

Cx : the values greater than the anomaly concentration
n: the number of anomal samples
m : the number of profiles
2L : the distance between profiles
Δx : the distance between the samples in each profile
Zonality index was calculated using areal productivity (K_p) and mineralization coefficient accordance (K_c) with equation (3) and (4), respectively. In equation (4), $\eta(\alpha)$ is the mineralization coefficient of element that was obtained using equation (5), $\eta_a(\alpha)$ is the total number of samples in the zone, and $\eta_a(\alpha)_{ore}$ is the number of anomal samples in the intended zone (Beus and Grigorian, 1977).

$$K_p = \frac{P(Pb) * P(Zn)}{P(Cu) * P(Ag)} \quad (3)$$

$$K_c = \frac{\eta(\alpha)_{pb} * \overline{CA}_{Pb} * \eta(\alpha)_{zn} * \overline{CA}_{Zn}}{\eta(\alpha)_{Cu} * \overline{CA}_{Cu} * \eta(\alpha)_{Ag} * \overline{CA}_{Ag}} \quad (4)$$

$$\eta(\alpha) = \frac{\eta_a(\alpha)_{ore}}{\eta_a(\alpha)} \quad (5)$$

Then zonality index was calculated with productivity and mineralization coeficient mount, and the detection of the blind mineralization was done with this index. In addition to the new method presented in this paper, integration of singularity and zonality was done in this area.
In this study 400 rock samples were taken from the studied area. Samples were analyzed for Cu, Zn, Ag, Pb, Au, W, As, Hg, Ba, Bi using emission spectrometry. The calculations of singularity map were coded in MATLAB programming software. A grid map was generated, then seven square windows (1*1 m^2, 3*3 m^2, 5*5 m^2, 7*7 m^2, 9*9 m^2, 11*11 m^2, and 13*13 m^2) were set. The average value of element concentrations were calculated by calculating the average value of the samples falling within a window for each window size. The average concentration value C[A(ri)] and the size of window ri (i=1,…,13) were calculated. A straight line was fited for C[A(ri)] and ri using squre method. The slope of the straight line was calculated to be α−2.

3- FINDINGS AND ARGUMENT

According to the zonality method and previous researches (Borna and Sodishoar, 2005) in Baggolom Area, the northwestern and northeastern parts of this area have potentials for exploration of blind mineralization. The anomaly of the central part of Baggolom is a zone dispersed mineralization. Singularity method was used for detection of blind mineralization in this area. Singularity map shows the weak anomalies. According to the singularity map of Cu in this area, the central and southwestern parts of Baggolom is a blind mineralization, while this results do not agree with zonality results and previous results (Fig. 1). But the singularity of zonality index (Pb*Zn/Cu*Ag) shows the enrichment and depletion of the zonality index and shows the correct place of blind mineralization in area (Fig. 2).

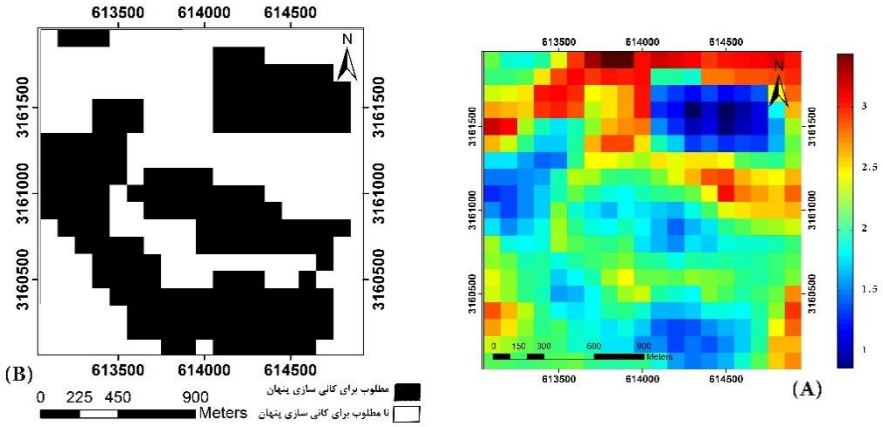

Fig1. A) Singularity map of zonality index value in Sungun , B) binery of map (A)

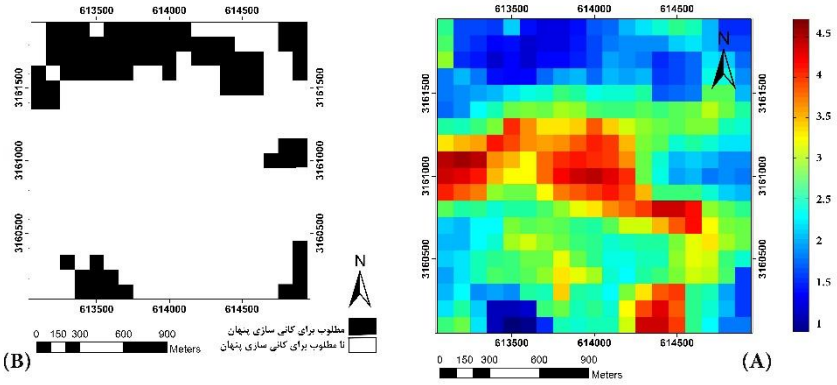

Fig.2 . A) Singularity map of Cu concentration value in Sungun , B) binery of map (A)

4- CONCLUSIONS

Detection of the blind mineralization zonality has been done using the zonality method so far. But this method cannot detect the weak blind anomalies. As observed in this study, there was a blind mineralization in the western part of the studied area that zonality method could not detect, while the combination of singularity and zonality methods detected the anomaly. Therefore, the singularity of zonality is a beneficial method for recognition of blind mineralizations.

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