Accepted Manuscript

Application of fractal-wavelet analysis for separation of geochemical anomalies

Peyman Afzal, Kamyar Ahmadi, Kambiz Rahbar

PII: S1464-343X(16)30279-5

DOI: 10.1016/j.jafrearsci.2016.08.017

Reference: AES 2654

To appear in: *Journal of African Earth Sciences*

Received Date: 17 February 2016

Revised Date: 12 August 2016

Accepted Date: 16 August 2016

Please cite this article as: Afzal, P., Ahmadi, K., Rahbar, K., Application of fractal-wavelet analysis for separation of geochemical anomalies, *Journal of African Earth Sciences* (2016), doi: 10.1016/j.jafrearsci.2016.08.017.

Application of fractal-wavelet analysis for separation of geochemical anomalies

Peyman Afzal[1*], Kamyar Ahmadi[2], Kambiz Rahbar[3]

1- Department of Mining engineering, South Tehran Branch, Islamic Azad University, Tehran, Iran

2- Department of Petroleum Engineering, Faculty of Engineering, South Tehran Branch, Islamic Azad University, Tehran, Iran

3- Department of Computer Engineering, South Tehran Branch, Islamic Azad University, Tehran, Iran

Abstract

The purpose of this paper is separation and detection of different geochemical populations and anomalies from background utilizing fractal-wavelet analysis. Daubechies2 and Morlet wavelets were used for transformation of the Cu estimated data to spatial frequency based on lithogeochemical data in Bardaskan area (SE Iran) by a MATLAB code. Wavelet is a significant tool for transformation of exploratory data because the noise data are removed from results and also, accuracy for determination of thresholds can be higher than other conventional methods. The Cu threshold values for extremely, highly and moderately anomalies are 1.4%, 0.66% and 0.4%, respectively, according to the fractal-wavelet analysis based on the Daubichies2 transformation. Moreover, the fractal-wavelet analysis by the Morlet wavelet shows that the Cu threshold values are 2%, 0.75% and 0.46% for extremely, highly and moderately anomalies and populations, respectively. The results obtained by the both WT methods indicate that the main Cu enriched anomalies and populations were situated in the central parts of the Bardaskan district which are associated with surface mineralization and ancient mining digs. Furthermore, results derived via the Morlet WT is better than Daubichies2 WT according to the correlation with geological characteristics by logratio matrix. The results obtained by the fractal-wavelet method have a good correlation with geological particulars including alteration zones and surface Cu mineralization which reveals the proposed technique is an applicable approach for identification of various geochemical anomalies and zones from background. However, the main targets for detailed exploration is located in the central part of the studied area.

Keywords: Decomposed Wavelet Transformation (DWT); Geochemical anomaly; Fractal-wavelet analysis; Daubechies wavelet; Morlet wavelet.

* Corresponding author Email address: P_Afzal@azad.ac.ir