Stream sediment geochemical patterns around an ancient gold mine in the Wadi El Quleib area of the Allaqi region, south Eastern Desert of Egypt: Implications for mineral exploration and environmental studies

Mohamed Abdallah Gad Darwish

PII: S0375-6742(16)30243-6
DOI: doi: 10.1016/j.gexplo.2016.10.010
Reference: GEXPLO 5835

To appear in: *Journal of Geochemical Exploration*

Received date: 18 April 2016
Revised date: 2 October 2016
Accepted date: 18 October 2016

Please cite this article as: Darwish, Mohamed Abdallah Gad, Stream sediment geochemical patterns around an ancient gold mine in the Wadi El Quleib area of the Allaqi region, south Eastern Desert of Egypt: Implications for mineral exploration and environmental studies, *Journal of Geochemical Exploration* (2016), doi: 10.1016/j.gexplo.2016.10.010

Stream sediment geochemical patterns around an ancient gold mine in the Wadi El Quleib area of the Allaqi region, south Eastern Desert of Egypt: implications for mineral exploration and environmental studies.

Mohamed Abdallah Gad Darwish
Geology Department, Faculty of Science, Aswan University. Post No. 81528 Aswan, Egypt. E-mail: m.a.darwish@mailcity.com. Contact Phone: 002-01146247189.

Abstract

The investigation of geochemical patterns in stream sediments around the newly discovered ancient gold mine in the Wadi El Quleib area is aimed at economic evaluation and environmental assessment of catchment sediments. For these reasons, forty stream sediment's composite samples were collected from the area covered by the metamorphosed ultramafic and their derivatives, volcanogenic metasediments, granitoid plutons, sand stones, and unconsolidated sediments. Fifty three chemical elements were analyzed using inductively coupled plasma–mass spectrometry. They were processed using various mathematical computations, graphical plots, and mapping techniques. The results revealed that the multiple populations within data set were caused by natural and ancient mining activities. Both geogenic and anthropogenic sources could influence on the dispersion of the elements of interest in the stream sediments. Despite sediments' materials were predominantly generated from metabasic and ultramafic provenance rather than mixed and flesic sources, and the area may have been subjected to more than one weathering cycle, they did not follow the sedimentary sorting and recycling trend. The lack of Au content and the negative correlation of Au with other elements are due to ancient human works and thus, the combined elements Ag+As, Ag+Hg, and Ag+Hg+As are considered the pathfinder for Au mineralization. The metamorphosed ultramafic and their derivatives, volcanogenic metasediments and their thrust contact host Au-mineralization, Cr-mineralization, and Ni-bearing minerals. Environmentally, the low values of contamination degrees and potential ecological risk indices of heavy metal(loid)s indicated that the sediment materials are good in quality and possess no actual hazard to human health. In general, the study area is more promising for Au mineralization and accepted as safe environment for the urban renewal purposes and land-use management in the future.

Keywords: Geochemical patterns, stream sediments, Gold and heavy metal(loid)s, economic and environmental evaluation, Wadi El Quleib area, south-Eastern Desert of Egypt.

---

1. Introduction

The primary geochemical patterns in rocks were formed during different geological processes; they can be transmitted during weathering to various surficial materials (Xuejing and Binchuan, 1993). Likewise, anomalous and background geochemical patterns are associated with different geological processes whereby anomalous geochemical patterns may be due to mineralization; background