

Geochemistry of stream sediments southwards of the SW Variscan suture in Portugal (Guadiana and Chança river basins): insights into element anomalies of variable origin and intensity

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Stream sediment samples were collected in the Trindade–Chança region at 1034 sites for mineral exploration purposes during 1996–97. Concentrations of Cu, Zn, Pb, Co, Cr and Ni are high enough in most sample sites to allow data assessment by multi-element anomaly definition and threshold computation using the area concentration multifractal model technique. The regional threshold values are 20, 45, 30 and 15 ppm for Cu, Zn, Pb and Co respectively. Anomalies for Cu, Zn, Pb, Co, Cr and Ni are delimited by first order local threshold values at 40, 94, 70, 21, 37 and 42 ppm. The main anomalies are clustered to the east-southeast of the surveyed region and reflect mixed contributions from a variety of sources, namely different volcanic units with local contributions from pelite rocks, contamination from old (abandoned) mining activities and hydrothermal mineralisation controlled by different fault zones.

Keywords: Multifractal modelling, Stream sediments geochemistry, Geochemical anomalies, Iberian Pyrite Belt, Pulo do Lobo Terrane, South Portuguese Zone

Introduction

Stream sediments are heterogeneous mixtures of debris derived from the surrounding watershed, including soils and different weathering products of rocks from the drainage basin upstream of the collection site; this includes various products of human activity whenever they exist and are in conditions to be removed by rainfall or other processes able to feed the watercourses. Consequently, the study of mineral and chemical composition of stream sediments is of considerable value in regional assessments of mineral exploration and environmental impacts. Investigation of stream sediment surveys is also an important tool to unravel the geological background of inaccessible areas, or areas devoid of significant outcrops and covered by dense vegetation.

However, in order to get reliable results and interpretations, stream sediment surveys should take

account of the inherent features of the region being sampled. These features include the geomorphology, drainage pattern, bedrock geology and general hydrological conditions, all of which are controlling factors on regolith and soil development, seasonality of stream flow and the variation of the total solid yield of the stream. The understanding of these factors is critical to sampling program design (namely to settle on site density and regularity per area), but additional attention should be given to the preparation and compositional characterisation of samples, as well as to data analysis (e.g. Weber and Davies, 1990; Mukherjee *et al.*, 2007; Alexakis, 2008).

This paper will focus on data analysis by demonstrating the advantages of multi-element anomaly separation and threshold computation using the area concentration multifractal model (Cheng *et al.*, 1994; Gonçalves, 2001). As a case-study, the technique was used to analyse Cu, Zn, Pb, Co, Cr and Ni distribution in stream sediments collected at 1034 sites of an irregular grid extending along the contact between the Pulo do Lobo Terrane (PLT) and the South Portuguese Zone in Portugal, from Trindade to Chança; this area partly overlaps the NE domain of the Iberian Pyrite Belt (IPB).

Geological and geomorphic features of the study area

The study area is located in the southern region of the Portugal mainland, along the northern domain of the

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