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Cu- and Zn-Soil Anomalies in the NE Border of the South Portuguese Zone (Iberian Variscides, Portugal) Identified by Multifractal and Geostatistical Analyses

F. Luz,[1,5] A. Mateus,[1,2] J. X. Matos,[3] and M. A. Gonçalves[2,4]

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Extensive Cu- and Zn-soil geochemical data in the Albernoa/Entradas–S. Domingos region (NE border of the Iberian Pyrite Belt, South Portuguese Zone) were examined to separate anomalies from background using the concentration–area fractal model. Distribution patterns of Cu and Zn concentrations in soil are primarily influenced by bedrock. The regional threshold values of Cu- and Zn-soil contents over metasedimentary sequences are 20–25 and 20–60 ppm, respectively, becoming 30–50 and 20–90 ppm, respectively, when metavolcanic rocks are present. The first-order threshold values for Cu are 80–90 ppm in soils over metasediments and 70–80 ppm in soils over sequences bearing metavolcanics. For Zn, the first-order threshold values are 40–80 and 90–100 ppm in soils over metasediments and metavolcanic rocks, respectively. Metasediments and metavolcanics comprising significant sulphide disseminations are outlined by Cu- and Zn-soil values above 100 and 300 ppm in soil, respectively. On the basis of these results, Alvares and Albernoa/Entradas areas emerge as the first priority targets for exploration. The observed non-coincidence of Cu- and Zn-soil anomalies in soil in the area could reflect difference in element dispersion during weathering, they mostly indicate distinct metal sources related to the original composition of different rock types or to chemical changes developed during Variscan deformation/re-crystallization path. The established regional baseline data can be used as reference for environmental studies.

KEY WORDS: Multifractal modelling, soil geochemistry, geochemical anomalies, Iberian Pyrite Belt, Pulo do Lobo Terrane.

INTRODUCTION

The chemical composition of natural materials (such as rocks, soils, stream-sediments, waters and vegetation) can indicate geological domains that may host ore minerals. This fact is the basis for the success of different methodological approaches upon which the modern foundations of exploration geochemistry rely, mostly consolidated throughout the 1930–1960 period (e.g. Hawkes and Webb 1962; Beus and Grigorian 1975; Tukey 1977; Rollinson 1993; Singer and Kouda 2001; de Caritat et al. 2005; Moon et al. 2006; Carranza 2009). Several factors contributed to this, namely: (i) the understanding that many ore-forming systems are enclosed in alteration haloes characterised by anomalous contents of various elements, distinct element associations or isotopic fingerprints; (ii) the recognition that certain elements can be used as reliable pathfinders, considering their behaviour

[1]Centro de Geologia da Universidade de Lisboa (CeGUL), Ed. C6, Piso 3, Campo Grande, 1749-016, Lisbon, Portugal.
[2]Departamento de Geologia e CeGUL, Faculdade de Ciências da Universidade de Lisboa, Ed. C6, Piso 4, Campo Grande, 1749-016, Lisbon, Portugal.
[3]Laboratório Nacional de Energia e Geologia, U.I. Recursos Minerais e Geofísica, R. Frei Amador Arrais 39 r/c, Ap. 104, 7801-902, Beja, Portugal.
[4]CREMINER-ISR/LA, C6, Piso 4, Campo Grande, 1749-016, Lisbon, Portugal.
[5]To whom correspondence should be addressed; e-mail: geo.filipa.luz@gmail.com

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