The use of multifractal modelling for targeting resources from soil and stream geochemistry data: the case of the Variscan basement of the Iberian Peninsula

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The safeguarding of access/use of many critical raw materials for Society requires that much of previously dismissed areas for exploration must be re-evaluated with new criteria in which the significance of "anomaly" should not be treated independently of the geochemical signals of the ore-forming processes and how the different chemical elements are interrelated. For much of the previous decade, several multifractal methods were methodically being refined as automatic tools to analyze and detect geochemical anomalies. These included the early concentration-area method (Cheng et al., 1994), singularity mapping (Cheng, 2007), and spectrum-area (Cheng et al., 2000), which has been recently combined with the bi-dimensional empirical mode decomposition (Xu et al., 2016) as a tool to separate different contributing sources of an otherwise complex geochemical pattern. We propose yet another approach, the use of geochemical indexes, which links to the geological and ore-forming processes known to define a given region in order to assess much of these numerical approaches. Therefore, we picked several areas from the Variscan basement in Portugal, with different geologic and metallogentic contexts, some of them previously analyzed with multifractal methods (Gonçalves et al., 2001; Jesus et al., 2013) and a multi-element geochemical campaign on which to test the different multifractal methods combined with the geochemical indexes, as an advantageous alternative to principal component mapping, for example. Some preliminary essays with stochastic models similar to those reported in Gonçalves (2001) and Agterberg (2007), with different overprinted pulses are presented as well.

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