**Biogeosciences
Discussions**

Interactive comment on "Density/area power-law
models for separating multi-scale anomalies of
ore and toxic elements in stream sediments in
Gejiu mineral district, Yunnan Province, China" *by*
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The authors thank all three reviewers for their constructive comments and the MS has been revised closely followed the comments of the reviewers and the editor. The details of revisions made to the Ms are explained item by item as below:

Anonymous Referee #1: The paper presents an excellent and very useful application of the fractal filtering technique in the field of geochemistry. The paper presents a coherent and very well developed exhibition, so much in its theoretical aspects as

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practical. In the conclusions, potential applications of the developed technique are exposed. In the version 4 of the paper have been corrected the defect of the figures 3 and 5, enumerated with uppercase letters in the first version. When changing to the lower-case confusions they are avoided in the text. However, although this doesn't have importance, I toss in lack in the text, especially the figure 2, the units used for the concentrations values.

Answer: A unit of ppm has been added to the text associated with figure 2.

Anonymous Referee #2: The authors show a technique based on spectral energy density in the context of multifractal theory. The objective is to map anisotropic singularities. I think that is an excellent work. Please, can the authors comment in a paragraph in the Methodology section a comparison with wavelet methodology? Since you are mention in many occasions Fourier Transform and the Frequency Domain many readers will have some questions.

Answer: A paragraph has been added to the methodology section about the main difference between the filter technique proposed in this paper and the other types of filtering techniques including wavelet based filtering. As it is explained in the text:

We know there are many different types of filtering techniques such as frequency – based high- low- and band-pass filters and wavelet filters. Most of these filters are involved filters defined with predetermined functions. The problem for these types of filters is how to decide the separation of low- and high-pass filters. In some cases these types of decisions are made arbitrarily. The method S-A introduced in the current paper involves separation of filters based on distinct self-similarities as defined using S-A plots. However, to empirically and systematically compare the results obtained by S-A method and many other filtering methods are still needed for a comprehensive evaluation of the effectiveness of S-A on filtering. This should be studied in our future research. This paper introduces a simple version of S-A so that it can be readily used in the field of soil imaging and non-linear imaging processing.

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The missing typo of one of the reference in the text has been fixed. Qan et al., 2008 should be Gan et al. 2008. It is already included in the reference section.

Referee #3: I congratulate to the authors for this contribution to the Special Issue. I would like that they include some comments based on the results of Figure 5. The authors divide in three sections the relationship of the spectral energy density and the area (S vs A). Are the three slopes significantly different? Please show the statistics Why to choose three and no two or four sections? Can we fit a general curve to all the three and then we can be talking about multifractal filter?

Answer: An explanation about how to decide to fit data on S-A plot with straight lines is added to the text: A number of straight lines can be fitted to the data. How many straight lines to fit the data can be intuitively determined with several considerations: how good the fitting will be, how significant different between the slops of straight lines fitted to the data, and whether the results to be obtained with the filtering determined are physically meaningful, in other word, the results can be geologically interpreted. In the case study, three straight lines were fitted to the data using the least squares (LS) method. These three lines separate the values into three ranges, where the distinct scaling properties of the S-A relation are maintained in each. These three ranges of S are separated by two cutoff values, S = 662.95 and 2295.79. The slopes of these three straight lines are significantly different, for example, -1.33, -1.97, -1.68, and the intercepts of the three straight-lines are 16.21, 20.34, and 18.15, respectively. The standard errors related to these three linear fits are 0.007, 0.002 and 0.004, respectively. These standard errors (values < 0.01) indicate the fittings of all three straight lines are statistically significant.

The other question asked by the referee about "Can we fit a general curve instead of three and then we can be talking about multifractal filter?"

Answer: we added a few sentences in the conclusion to answer this question: Since it often involves multiple ranges of energy power density (S) in the process of defining filters, for example, in the case study used in the current paper, it involves three ranges

of S within each a power-law function is established between energy density (S) and area (A), these types of filters can be termed multifractal filters.

Once again we would like to thank all three referees about their comments and we hope the revisions and the answers provided to the questions are satisfactory.