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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "Inversion of Residual Gravity Anomalies using Tuned-PSO Technique" *by* Ravi Roshan and Upendra Kumar Singh

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This manuscript discussed the application of Tuned particle swarm optimization (PSO) techniques to the calculation of residual gravity anomalies, used to detect under-ground ore deposits or other sources of local gravity variations. Compared to other inversion techniques the authors claim higher computational speed and improved error handling when using the described method. While the modified version, taking the first referee's comments into account, improved the readability of the manuscript already, several questions were not addressed yet sufficiently to give the reader a clear idea of the method and the quantitative advantage of its application. Especially the authors should bear in mind that not all readers of the GI-journal will be specialists in both of the related fields - residual gravity anomaly analysis and particle swarm optimization techniques.

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This said I encourage to address questions 2 (what are the improvements in the results using tuned PSO rather than other techniques) and 4 (selection of the learning parameters) of the first referee in more detail than already done in the updated version. Especially a more detailed step-by-step description of how the optimized learning parameters are chosen would improve the usefulness of the article to a wider range of readers significantly.

I am not going to remark on typographical errors as the manuscript will undergo anyhow a proof-reading editing process by the publisher before releasing the final article. Some further improvements by the authors would be helpful, though.

The following detailed comments refer to the line numbers in the submitted second version of the manuscript.

Line 83: As the unit "Gal" was depreciated already 10 years ago, though still used in the science community focusing on gravitational anomalies, it should be replaced in an article for the general public by the SI-units (1 Gal is equal to 0.01 m/s2) or at least its definition given once in this context. It should be explicitly pointed out that the amplitude A will have different dimensions due to the different exponents of m and q for the various shapes. On the first glance it looks like a typing mistake of having sometimes kmˆ2 and sometimes only km as part of A's units. Explicitly give the used assumptions forthe numbers and the reasoning / source behind them: As A is a derived value the tunable parameters are density contrast and R.

Equation (2) in line 90: g(0) depends also on z and q, so it should read g(0,z,q)=..

Equation (3) in line 93: Define "awgn" (Additive white Gaussian noise) before using it! Giving first the long name with a reference one could state that the corresponding MATLAB function awgn is used.

Equation (4) in line 105 is illogical, mixing velocity components and position components. Please elaborate! Taken without further comments it looks as if you are adding

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meter to meter/second and derive again a unit of meter.

Section 4, starting at line 117: It is this section which discusses the selection! Rephrase to something like "In the following sections the selection process for the most important parameters will be discussed." Also the heading of section 4 should be changed, as "Discussion and Results" is misleading when the actual contents of the paper are detailed here. Please try to make this section as detailed as possible - see my initial remark and the related one from referee 1.

Line 137: Why is Vmax fixed to 30 for the given position range? (Related to equation 4 with mix of coordinate/velocity space). Please explain in more detail here in case the explanation to equation (4) does not make this conclusion obvious.

Line 204: Please give an example for computation speed improvement mentioned in the introduction and in line 238 in the conclusion section or at least an estimate for the duration of the computation process.

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