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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Full-tensor gravity gradient eigenvector analysis for locating complex geological source positions" *by* Boxin Zuo et al.

Anonymous Referee #1

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The manuscript gives a lengthy description of the underlying method followed by synthetic data studies and a real case using full gravity gradient tensor data.

1. I find the theoretical description much too long and too complicated. Based upon the direction of the eigenvector belonging to the largest eigenvalue of the gravity gradient tensor and the product of the vertical component and the tangent to the angle of inclination of the eigenvector a strategy is outlined to not only locate the center center of mass of a distributed source but also to outline its horizontal boundaries. Basically it is impossible to outline the boundaries using the eigenvectors. Take for example a spherical body. Using the same technique you would apparently outline the boundaries of the sphere. But this cannot be done because you need to know the density contrast of the sphere.

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2. There is no reason to rotate the tensor prior to calculating the eigenvectors and eigenvalues since they are per definition independent of that. The tan(phi) can simply be expressed as the ratio between the vertical component and the horizontal component as is also indicated right below equation (3).

3. I am not convinced the location of the boundaries of isolated bodies can be made using the proposed method. Rather I think by looking at the real data example in figure 13f you have identified several “point sources” making up more complicated structures.

4. The results for synthetic data as presented in for example figure 4 are ambiguous since the contour lines have no units.

5. Compared with the results of standard methods in figure 13 I feel that the tan(phi) method is less sensitive to boundaries in agreement with the theoretical arguments given in 1.

My recommendation is to reject to manuscript due lack of significance and demonstrable errors.

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