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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Estimation of the total magnetization direction of approximately spherical bodies" *by* V. C. Oliveira Jr. et al.

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Review of "Estimation of the total magnetization direction of approximately spherical bodies" by Oliveira et al.

The paper by Oliveira et al. presents an updated approach to estimate the direction of magnetization for spherical bodies. The description of the motivation, method and examples is sound and the results of the study are reasonable. A few issues are slightly confusing and somehow hinder the full evaluation of the model. For the synthetic examples, a spherical body and prisms are chosen. First, the magnetization direction of the spherical body is inverted and afterwards the magnetization of the prism to study the error introduced by a non-spherical geometry. But at the same time the inclination and declination are changed, so that no direct comparison with the inversion for the

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spherical body is possible. I would suggest inverting first for the same parameters, but by only changing geometry and in the second step changing inclination and declination more drastically compared to the applied inducing field. If the method is supposed to be able to resolve remanent magnetization, it would be interesting to see how the method performs for anomalies with reversed magnetization.

This is somewhat shown for the application to the real case, but should be demonstrated before. All the inversions presented consider that the location of the source body is known. The real case anomaly is in this respect as well an ideal anomaly as rarely such isolated, large amplitude anomalies are observed in field data. If the position of the source is known for example from Euler Deconvolution, the estimate of the inclination and declination is almost trivial even by forward modelling. More interesting would be an example, where a regional field superposes the local anomaly or to some degree two anomalies overlap. Euler Deconvolution will provide results in both cases, but with less confidence in the horizontal position, which will affect the magnetization directions. In summary, the study by Oliveira et al. is a sound technical paper, but has yet limited value for application to real data. A suggestion would be to add a more sophisticated example by using the well-known Bishop 3D model to evaluate if the method has an advantage in complex geological situations.

Below some additional comments for rephrasing and shortening in the abstract and introduction:

Page 2 Sentence starting Line 19: These results show that the non-outcropping sources near from the alkaline complex of Diorama have almost the same magnetization direction of that as the ones in the alkaline complex of Montes Claros de Goiás, strongly suggesting that these sources have been emplaced in the crust almost within the same geological time interval.

Line 26: mineral and petroleum exploration

Page 3 Line 4 Rephrase as: of the most important data acquisition techniques due to

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the ability to cover large areas in a relative short period of time

Line 23: Delete this sentence: The total-field anomaly represents the Euclidean norm of the magnetic induction produced by the magnetic sources in the subsurface. Repetition from before.

Paragraph starting in Line 28: This you can delete as it is not relevant here.

Interactive comment on Nonlin. Processes Geophys. Discuss., 1, 1465, 2014.