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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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The forward problem described is essentially identical to a mesh-based discretization but with the space-filling mesh cells (prisms, tetrahedra, etc) replaced with spherical (dipole) sources. Hence, the methods presented are essentially identical to those used by Lelievre & Oldenburg (2009) and Ellis et al. (2012). The difference is that where Lelievre, Ellis et al. develop methods to solve an underdetermined inverse problem (many more mesh cells than data observations), the authors of this manuscript only consider the solution of a simpler overdetermined problem (far fewer source parameters than data observations). The same overdetermined problem can be solved by the methods of Lelievre, Ellis et al. As such, there is little new material here and I don't see what value this paper adds to the scientific community. The only item I see worth

mentioning is the authors' application of the propagation of covariance method (Bard, 1973; Aster et al., 2005) to analyse their inversion approach, but the propagation of covariance is not a new method. The authors' suggestion of upward continuation to aid the applicability of their methods is not particularly insightful: the response of non-dipole sources look more and more like dipole responses as the data measurement level is moved further from the sources (this is a well known phenomenon). There is a tremendous amount of prior knowledge required about the sources to use these methods, despite the authors claiming the opposite in their conclusion: one must assume the sources are somewhat spherical, and one must have a reliable estimate of the number of sources and their locations (lateral and depth). As such, I don't see these methods being widely applicable.

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