Editorial team
Geophysical Journal International

19th December 2024

Dear Editor,

We are pleased to submit the original research paper titled "Euler inversion: Locating sources of potential-field data through inversion of Euler's homogeneity equation" for consideration by Geophysical Journal International.

The paper introduces a novel method that we have developed, which we call *Euler inversion*, for estimating the location and approximate geometry of sources of gravity and magnetic anomalies. Euler inversion is a significant departure from established methods (mainly Euler deconvolution and its variants), both in terms of the mathematical formulation and the higher robustness of the results to random noise and the presence of interfering sources. Instead of a linear inversion, we perform a non-linear inversion which can estimate both the model parameters and the predicted potential-field and its spatial derivatives. The mathematics used are similar to total-least-squares from statistics and the combined adjustment from geodesy (which was the inspiration for our work). An added benefit of being able to provide predicted data (which Euler deconvolution cannot do) is that Euler inversion can also estimate an integer structural index, which is related to the source geometry. We found that the best index is the one that minimizes the data misfit. Euler inversion is also fast to execute on a standard computer, making it a practical alternative to Euler deconvolution on an Earth scientists toolbox. All of the code and data needed to reproduce every figure is provided through the DOI and GitHub repository to which there are links in the paper.

Thank you for your consideration of our manuscript.

Sincerely,

India Uppal (on behalf of all authors)

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