Dear Max Moorkamp,

Thank you once again for your time in reviewing our manuscript.

The clarification you brought in your latest comments lifted our misunderstanding on the underlying issue you had with the model setup for inversions. At some point in the revision process, our impression was the validity of the forward calculation of magnetic data, rather than padding in the mesh, was questioned.

We have modified the meshes used in both the synthetic proof of concept and field application case and repeated the modelling process. The new meshes cover a much larger volume of rock. On the mesh we used, we ensured that, as you highlighted, the magnetic data anomaly goes to zero under the conditions that you mentioned in your previous reply. We took this chance to also use slightly differing meshes for the calculation of the true data and for the inversion, thereby reducing the severity of the common "inverse crime" (Kaipio and Somersalo 2007; Wirgin 2004) committed here by using very similar settings for both the generation of synthetic data and its inversion.

The new synthetic data is different from the original model, but it presents similar-looking features. We have rerun all inversions shown in the updated version of the manuscript using meshes with extended padding as mentioned above (see manuscript for more info). While there are obvious dissimilarities, the recovered models present features that are insufficiently different in both geometry and property to previous results to require us to change our conclusions and interpretation. For example, the interpretation of the magnetic anomaly located between 464 km and 467 km remains as an intrusion (L26, field application).

In the synthetic case, we did not rerun case (f) as it was originally intended as an interesting addition but was not really related to the field application. It was simply showing an example of combining two types of constraints using information from MT in the inversion (one about the petrophysical values, through local ADMM constraints, and the other about the spatial variations of petrophysical values through the smoothness constraints). Having one fewer inversion, we have deleted the figure summarizing the metrics (Figure 8) and replaced it with a table (Table 3). We note that we have added the same simulated noise contamination to the synthetic data and now represents a higher average fraction of the maximum amplitude of the data (4% vs 2.5% previously).

In the field application case, we are not using the sensitivity domain reduction approach anymore. This slightly improves the accuracy of calculation of the forward response. We have deleted the paragraph summarizing the method.

In the text of the manuscript, we have replaced '<u>d</u>isjoint <u>i</u>nterval <u>b</u>ound <u>c</u>onstraints' by 'DIBC'. We also replaced a number of occurrence of 'ADMM bound constraints' by 'DIBC', which we think is more accurate and easier to read.

Thanks, and regards,

The Authors

References

Kaipio, J. and Somersalo, E.: Statistical inverse problems: Discretization, model reduction and inverse crimes, J. Comput. Appl. Math., 198, 493–504, https://doi.org/10.1016/j.cam.2005.09.027, (2007).

Wirgin, A.: The inverse crime, https://doi.org/arXiv:math-ph/0401050v1, (2004).