Denli, Huseyin

To:	wliuyang@vip.sina.com; huseyindenli@gmail.com
Cc:	jeremybrandman@hotmail.com
Subject:	RE: GEO-2021-0742 - Moderate Revision Required

Dear Dr. Liu,

Thank you for the feedback on our Geophysics paper. Please find below a list of edits made in response to comments from the Associate Editor and Reviewer 1. Also, please note that that we have included three recent references to address your comment.

Feedback from the Associate Editor:
1.   This was a great suggestion. We restructured the paper by reorganizing the methodology and the examples sections. In particular, we regrouped the examples into application areas in order to make the paper more compact.
2.   The norm in Eq. (2) is an arbitrary norm which is stated in the description of the formulation. I think that makes it clear that any norm square could be employed in Eq. (2)
3.   We updated part of the discussion to reflect that the shape inversion methods we are discussing in the paper allows for a smooth variation of the inversion parameters within a shape. We agree that density should vary in depth and discussed it in the section involving gravity inversion example.
4.   We updated the first-arrival travel time section to eliminate this confusion.
4'.   We agree that noise is a key factor to consider to evaluate the robustness of inversion algorithms. We mentioned that this could be a great future work to consider in the concluding remarks.
5.   We do have an FWI example to show the power of our shape inversion methods. We updated the examples section to avoid any confusion about the FWI example.

Feedback from Reviewer 1:

1.   Our paper includes examples from flow in porous media, gravity inversion, travel time inversion, and full-wavefield inversion. Therefore, we have kept "geophysical inversion" in the title.
2.   We agree that noise is a key factor to consider to evaluate the robustness of inversion algorithms. We mentioned that this could be a great future work to consider in the concluding remarks.
3.   We do have an FWI example to show the power of our shape inversion methods. We updated the examples section to avoid any confusion about the FWI example.
4.   We have removed "FWI" from the conclusion.

Best Regards,
Huseyin Denli and Jeremy Brandman

-----Original Message-----
From: Geophysics [mailto:onbehalfof@manuscriptcentral.com]
Sent: Wednesday, February 23, 2022 9:46 AM
To: Denli, Huseyin <huseyin.denli@exxonmobil.com>; huseyindenli@gmail.com
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jeremybrandman@hotmail.com
Subject: GEO-2021-0742 - Moderate Revision Required

External Email - Think Before You Click

23-Feb-2022

Re: GEO-2021-0742, Shape-constrained Geophysical Inversion

Dear Author(s):

The review process has been completed for your manuscript listed above and the critiques of the reviewers are enclosed. Revision is necessary for your paper to be considered further for publication. I encourage you to revise your paper addressing the comments of the referees.

PLEASE NOTE:
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3. Describe the method.
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earlier might be necessary in order for your paper to be reviewed and accepted before the section closing date. Please e-mail (geopapers@seg.org) if you have questions about the closing date and/or your due date.

If you decide not to pursue a rewrite, or you decide to submit the paper to another journal, please let us know as soon as possible.

Thank you for your contribution to GEOPHYSICS.

Sincerely,
Dr. Yang Liu
wliuyang@vip.sina.com

_____

Assistant Editor comments for authors:

Dear authors,
Thank you for submitting an interesting manuscript to Geophysics. Some critical comments have made by the reviewer and the AE for the manuscript. I hope these comments will help you improve the manuscript significantly. Please respond carefully and satisfactorily to all the comments.
In addition, there are no references in recent five years, please add several related ones.
Yours sincerely,
Yang Liu

Associate Editor comments for authors

Associate Editor
Associate Editor`s Comments for Authors:
Dear Author(s),
I have very muc enjoyed reading your paper. It is well written. The underpinning work is very good, and this is sure to make an impact when published. However, the paper also has a few shortcomings.
1) Organisation of the paper. Blending in the results with the discussion section, results in two very long unorganised sections (one for MS inversion and one for PF inversion). I would suggest to separate, the presentation of the examples from the discussion of the examples, and also use subsections.
2) The norm in Eq. (2) is not a general term (it has a square in there) - Eq. (3) tje MS term has a general norm indeed.
3) Even though I recognise the power and legitimacy of assuming common shapes amongst common parameters. These shapes are unlikely to fields with constants. Density, for example, has a well known depth trend (compaction). I think interfaces are likely to coincide, but within the fields, properties may vary smoothly and differently from each other. A discussion of such matters may suit the introduction.
4) For the seismic inversion example, the reader has to read in between the lines (no clear description is given). It appears to be that the inversion is traveltimes (picked from a gather) and modelled with an eikonal traveltime solver. But perhaps the data itself is also modelled using an eikonal equation (and the waveforms are merely shown for illustration).
4) Noise, especially coherent noise in data, is a big spoiler. It would be very good to see the addition of some realistic noise in the examples.
5) As R1 points out, it is prudent not to over-claim applications that are not shown (FWI). One can, of course, write that the theoretical formulation as given holds for a variety of applications.
I feel that with moderate revision, this paper will be very strong.
Best wiuhes,
Sjoerd de Ridder.

Reviewer: 1

Reviewer`s Comments for Author

The paper employs the Mumford-Shah functional used for image segmentation and the phase-field inversion technique to improve traveltime inversion (tomography) and gravity inversion. However, the authors use the general term of geophysical data for inversion. I would suggest focusing on traveltime tomography and gravity inversion instead of geophysical inversion, as they are what the paper address and the authors have not yet demonstrated the other inversion applications to such as full-waveform inversion as they claim. The numerical examples are based on traveltime picks from synthetic data. Please demonstrate the robustness of the inversion methods for errors in traveltime picks (and noise in gravity data), because errors in first-arrival traveltime picks are common in real seismic data (and in real gravity data). Since the paper is not on full-waveform inversion, and the paper has never used "full-waveform inversion" in the text, the authors should not use "full-waveform inversion" as a key word. The author should also select some other key words to replace those selected to reflect the real "key words" in the paper. Please change "FWI" to "full-waveform inversion in the "CONCLUDING REMARKS" section. Please provide algorithmic workflows for both algorithms. The authors should rewrite the conclusion section to summarize the findings.