

Geosci. Model Dev. Discuss., author comment AC2  
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## Reply on RC2

Fernanda Alvarado-Neves et al.

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Author comment on "3D geological modelling of igneous intrusions in LoopStructural v1.4.4" by Fernanda Alvarado-Neves et al., Geosci. Model Dev. Discuss.,  
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Dear Italo,

Thank you for your feedback. Please, see below our response to your comments:

*I believe the authors should try to isolate the strengths, limitations, and benefits of the three main components of the proposed methodology, namely the use of (i) structural frames, (ii) ODSIM, and (iii) parametric conceptual models. Experiments using (i) and (ii), (i) and (iii), just (i), etc. would be too much work perhaps, but their isolated effects and their contribution to the final result must be measured somehow. It might be that one of the three is completely unnecessary or redundant, at least for the case studies provided.*

An assessment of the benefits and limitation of each of the three main components (structural frames, ODSIM, and parametric conceptual models) sounds interesting, however we agree that various experiments to isolate their advantages will be outside of the scope of this paper. We propose to discuss the expected effects on removing each of the component and qualitatively assess their contribution to the method.

*Please clarify the mathematical notation. It is common to use lowercase for scalars, bold lowercase for vectors, and bold uppercase for matrices.*

We will fix the mathematical notation as suggested.

*Section 2.1 - A figure with a conceptual explanation would be interesting. If a 3D example becomes too convoluted, cross-sections or a 2D example can be used.*

We will include a figure of the ODSIM workflow, and tentatively we will make a figure showing how intrusions frame are incorporated in the ODSIM workflow.

*It is not clear whether the  $g$ ,  $p$ , and  $l$  fields are scalar or vector fields. Lines 314-326 present some ambiguity in this regard. The text mentions isovalues, supporting the notion of scalar fields, but it also mentions orthogonality between  $p$  and  $l$ , suggesting that they are in fact vectors. Do you mean orthogonality between their gradients? If  $g$ ,  $p$ , and  $l$  were in fact vector fields, then one would have to interpolate 9 variables instead of 3.*

$g$ ,  $p$ , and  $l$  are scalar fields and the orthogonality is between their gradients. We will clarify this in the text.

*Why use simulations? Wouldn't it be possible to use kriging or RBF (even if you must compute normal scores first) to obtain a "mean" surface?*

We will evaluate using exact interpolation methods instead of simulations. We mainly used simulations following the ODSIM proposal, however, our method does not aim to generate several realizations of each model, so using interpolation would probably be a simpler way of computing the distances thresholds along the frame axes.

*Section 5.1 and lines 473-477 - For the sake of fairness to RBF, you could employ an elliptical conceptual model in this case as well. It should be simple to define a parametric base field and subtract it from the signed distances data.*

Regarding CS3 and its RBF 3D models, the authors will create the 3D models using an elliptical conceptual model to make a fairer comparison.

*Figures 7, 8, 10c, and 10d: please discuss the possible causes for the jagged aspect of the models. I suspect it has to do with the use of simulations.*

The jagged aspect of the models in Figures 7, 8, and 10 is because of the grid. It will be discussed, and we will run the models with a finer grid for the figures.

*Lines 555-556: I see it as an advantage, rather than a limitation. User input in this form allows for more flexible and realistic models. It may require extra work and thought, but that is why professionals are trained.*

This is true, thanks for the comment, we will rephrase this part of the discussions.

Regarding the minor comments, these will be addressed to improve the quality text.