Solid Earth
Discussions

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Interactive
comment

Interactive comment on "Topological Analysis in Monte Carlo Simulation for Uncertainty Estimation" *by* Evren Pakyuz-Charrier et al.

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1 General comments

>The MCUE procedure does not inherently assume data inputs to be independent. This was merely a working hypothesis for this particular case study. Any level of dependency may be added to the perturbation via hypersampling. A round of independent perturbation is first applied to all data and is then followed by the application of a bias/drift function to the data. The bias is itself drawn from a standard distribution of the same type as that one used in the first round. Manuscript updated for clarity.

>That is most definitely correct. Although, it does not constitute a limitation of the method per se. Rather it is a limitation of the GeoModeller API in its current itera-

tion. More complete topological signatures could not be extracted easily. This point is actually already mentioned in the discussion.

2 Detailed comments

2.1 Basic concepts

>Both acronyms removed.

>Combining all models into a single PGM or UIM implies an assumption of population singleness.

2.2 Source of uncertainties

>Disturbance distributions may be parameterized freely to account for any type of quantifiable uncertain tie. Other types of uncertainties such as conceptual uncertainty or technical failure are not statistical and are therefore out of scope of this paper.

>This point was brought by G. Caumon too. As mentioned in a previous comment, MCUE may be parameterized freely and independence was actually a practical assumption. This has been clarified in the manuscript.

>Measurements values may indeed be fully or partially dependent when taken on the same structure. Although, this does not mean that errors have to be. Both concepts are separate. For example, seismic horizon picks over a lithological interface would be measurement and error dependent. Conversely, regular compass measurement over the same structure would be measurement dependent only. The assumption is now stated clearly.

2.3 Unimodality

>The computation itself is modality neutral. However, expressing the dispersion of a dispersion with a single scalar entails that multimodal distributions will become ambiguous. Therefore, the usage of both indicators as a proxy for uncertainty, in fact, assumes unimodality.

>See previous comment.

>Homogeneity is here defined as population singleness. Manuscript was updated for clarity.

2.4 Linearity

>The perturbation process induces changes in the vector field function from which a single iso-potential surface is extracted to represent the top or bottom of the modelled formation. These changes are linear because the co-kriging algorithm used to inter-polate the field is also linear. This effect is not related to the choice of disturbance distribution. The geometrical ruleset is what introduces piecewise non-linearity, not the perturbation process itself. This non-linearity is present in any implicit model which comprises a fault and/or more than one formation. Altering the geometrical ruleset is of course very likely to produce non-linear changes, however this process is outside the scope of the paper.

>Removed.

2.5 Topological signature

>Discretization is a constraint rather than an active design decision in this instance. The GeoModeller API does not provide any function point to extract topological infor-mation directly.

>Unfortunately, the GeoModeller API did not offer a practical way to extract this infor-mation at the time. However, one can assume that the discriminatory power of topology would be improved by including faulted contacts/intersections. On this basis, the pro-posed method would also improve.

>Correct, the relevance of the unit diagonal is now mentioned when the concept of topological signatures is introduced.

>Removed.

2.6 Entropy

>Equation was incorrect, now fixed.

2.7 Post-process

>The method described is actually being proposed rather than demonstrated. The project ran out of funds and time to complete this part. It can be removed without compromising the paper if necessary.

>The concept of thresholding is based on the premise that the method should attempt to guarantee statistical significance of the uncertainty models for each cluster. Small sized clusters, provided that stationarity is verified, are statistical outliers and do not provide any insight in terms of uncertainty. The exact threshold value of 60 was, however, a matter of convenience.

2.8 References

>We have been using the official Copernicus EndNote template to format the references. https://publications.copernicus.org/for_authors/manuscript_preparation.html. We expect the editing team to handle this matter.

>See previous comment.

>Fixed.

>The 3 appendices are now appropriately called inline.

2.9 Grammar

>Rewritten.

>Removed.

>Groundtruthing is an accepted term used in Geophysics and GIS communities. As for its formality in the common language, a reference can also be found in the Oxford dictionary. All subsequent minor grammar issues were addressed in the manuscript.

Interactive comment

2.10 Image quality

>Low quality images were replaced with suitable ones.

>Idem.

2.11 Figure 3

>Figure 3 was removed.

>See previous.

>Idem.

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