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Discussions

Interactive comment on "Actors, actions and uncertainties: Optimizing decision making based on 3-D structural geological models" *by* Fabian Antonio Stamm et al.

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Dear Evren Pakyuz-Charrier,

Thank you very much for reading our manuscript and commenting on it. Considering some of your remarks, it seems to be the case that aspects of our manuscript can be misunderstood, if read in a certain way - especially with regards to the actual focus of this paper. Possibly, we did not make our intent sufficiently clear from the beginning, and we wish to correct this not only here, but also in a revised version of the manuscript.

As stated several times throughout our original text, we propose the use of custom

loss functions as a Bayesian decision-making tool that could be used in the context of geological modeling. This is what we regard as a novel approach, in this field at least. In no way did we mean to convey that we present Monte Carlo simulation, topological analysis, uncertainty quantification or any combination of these methods as something new. We have worked and published in this field for almost a decade (Wellmann et al., 2010) and are well aware of the existing literature. In fact, topological analysis in particular is absolutely not the focus of our work (the term is not even mentioned anywhere in the manuscript). To be sure, the algorithms for trap volume calculation we use are topology-related, but we merely use this as a basis to attain the maximum trap volume as an intermediate quality of interest. Our focus lies on the subsequent aspects of Bayesian decision theory, which could be applied to very different parameters and settings, disregarding topology. Of course, topological analyses would add interesting aspects to the sampling itself, and we are currently preparing a manuscript with more details - but this is not the context of the work presented here.

It is true, that a real case study would have been nice to examine, and this was acknowledged in our discussion section, so were the limitations regarding geometrical variability. While this is a good point to make, it does not affect the main aspect of this work, which is the evaluation of the method we employ for decision making. As we combined our method directly with probabilistic geological modeling approaches implemented in the software GemPy (de la Varga et al., 2019), one could readily apply the Bayesian decision making approach to more complex scenarios. We limited the study to a conceptual case of a typical trap structure, in order to provide an intuitive example that many researchers can easily relate to.

In addition, we would like to express our concern regarding the use of "Monte Carlo Uncertainty Estimation" (MCUE) as an actual term. We share the view of Prof. Caumon who, in the review of Pakyuz-Charrier et al., 2018 (available here: https://www.solid-earth-discuss.net/se-2017-115/se-2017-115-RC3.pdf), stated: "Monte Carlo simulation for uncertainty estimation" (as in the title) seems clearer to me than "Monte Carlo

simulation uncertainty estimation" (...). Therefore, I would recommend to replace MCUE by a more specific term (including in the paper's title)". We also consider that coining a widely used concept with a new term is potentially misleading. Furthermore, the few references that were primarily used to support its usage (Camacho et al 2015, Beven & Binley, 1992), do not mention the term MCUE.

Nevertheless, we acknowledge that you have highlighted some shortcomings on our side. We apparently did not communicate well enough the difference between the methods which we choose as an exemplary basis, and the ones we introduce as a new and possibly useful tool in this context. We will clarify the above points in the revised version of the manuscript. You also named some references that are certainly worth considering and that we will include in the revised version of our paper.

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