

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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This is a good paper with a focus on practical use of uncertainty propagation in implicit 3D geological modelling. The community indeed deserves more than mere uncertainty estimates and expects tools to extract useful knowledge from said estimates. Following risk assessment is risk mitigation.

The paper puts emphasis on the topological aspect of Monte Carlo Uncertainty Estimation (MCUE). That is, in MCUE the hypothetical opening and closing of traps becomes a discrete problem affected by piece-wise non-linearity.

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This problem is difficult, although by no means it constitutes a limitation of the method and actually underlines one of its greatest strengths: contrary to analytical, simulated or inverse uncertainty propagation methods, the plausible models used in MCUE as intermediary steps are actually built and available for pre and post-analysis.

In this case, simple first order topological analysis methods applied to plausible models are demonstrated to be of potential use in oil & gas exploration and reserve estimation. One could regret the absence of a real case study. As the sampling is limited to formation thicknesses and fault offset, the MCUE process is also very unlikely to satisfactorily express the geometrical variability upon which the proposed method relies.

It is quite unsettling that the paper appears to inaccurately present these methods as new and unheard of (Winter 1994, Clementini 1997). Moreover, topological analysis applied to 3D geological modelling is fairly common (Deutsch 1998, Pellerin 2015). Topological analysis applied to MCUE methods is known (Thiele 2016, Pakyuz-Charrier 2018). The topic of topological analysis combined with risk estimation for oil & gas reservoir estimation has been covered too (Li 2012, Bazaikin 2013).

The work done is commendable and, in my opinion, is worth publishing. On a more personal note, I am pleased to witness other groups take on the topological aspect of MCUE.

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