

To reviewer 2:

Dear Dr. Mark Jessell,

We would like to thank all your wonderful work so that we could get the reviewed manuscript promptly. We appreciate all your valuable comments and suggestions, which are helpful to improve our manuscript. In this document, we try to address your comments in detail. Let's discuss more if some of our explanations in the responses are not clear to you. The related modifications are not shown in the responses but are all marked in the manuscript revision history.

Thanks!

1. The challenges facing the use of ML in the geosciences were nicely summarised in the following paper, that may be worth referencing. A. Karpatne, I. Ebert-Uphoff, S. Ravela, H. A. Babaie and V. Kumar, "Machine Learning for the Geosciences: Challenges and Opportunities," in IEEE Transactions on Knowledge and Data Engineering, vol. 31, no. 8, pp. 1544-1554, 1 Aug. 2019, doi: 10.1109/TKDE.2018.2861006.

Thanks for your suggestion. We have added this reference citation in the manuscript (Line 56).

2. May be good to refer to other works that are in the space of using synthetic labelled models to train ML:

<https://gmd.copernicus.org/preprints/gmd-2022-245/#discussion>

<https://essd.copernicus.org/articles/14/381/2022/>

<https://doi.org/10.1016/j.cageo.2021.104701>

<https://geoscienceletters.springeropen.com/articles/10.1186/s40562-022-00241-y>

Thanks for your suggestion. We have added these related reference citations to the space of using synthetic labelled datasets to train the network in the manuscript (Lines 57-58).

3. Although artificial geophysical noise is tested in this study, unless I am mistaken there is another aspect of model variability, namely the natural variability of rock properties, which is not taken into account. This can be due to initial variations in provenance, or in variable compaction. This could be discussed in later sections and considered for future studies.

Thank you for raising this important point. The diversity of rock properties due to variable compaction is reflected in the porosity model obtained from stratigraphic forward modeling. However, the diversity of rock properties due to initial variation in provenance has not been included in the simulation processes. Therefore, we have added the natural variability of rock properties to enhance the diversity and realism of the porosity model in the discussion (Lines 448-449).

4. The use of a specific modelling engine (pybadlands) rather than an alternative could

have implications for the outcomes, in the discussion it may be worth highlighting the strengths and weakness of this particular simulation platform versus others that exist in terms of their predictions?

Thanks for your constructive comment. We have highlighted the strengths and weakness of the specific modelling engine (PyBadlands) in the discussion (Lines 410-415).