

Interactive comment on “Sparsity-based compressive reservoir characterization and modeling by applying ILS-DLA sparse approximation with LARS on DisPat-generated MPS models using seismic, well log, and reservoir data” by Mohammad Hosseini and Mohammad Ali Riahi

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The general comments are:

The paper “Sparsity-based compressive reservoir characterization and modelling by applying ILS-DLA sparse approximation with LARS on DisPat-generated MPS models using seismic, well log, and reservoir data” include a workflow that is integrating multi-point statistics and some type of classification for reservoir characterization and

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modelling. The workflow applied on one producing field with some hard and soft data. The results verified with different measures including subsequent drilling outcome. The topic is certainly the subject of international research and the access to the dataset that the authors had made it possible to carry out the study and test the integrated multi-point statistics and a type of machine learning workflow. The text is fluent and easy to read and understand for large part of the paper.

However, there are some issues with the structure and organization of the paper. These issues are: The standard structure of a paper including introduction, methodology, result, discussion, and conclusion is not consistent and clear enough. Below is more detail for every section: In the introduction, we expect to see the state of the art with references. This is done but unnecessary numbering of the introduction made it very long. A brief of the method applied must be given which is not clear in the introduction. A simple guide can be found in: J. F. Claerbout, 1991, "A scrutiny of the introduction," *The Leading Edge*, 10, 39. There is a lot about the case study in the introduction which must be reduced significantly. So make introduction shorter, focus on state of the art for the main elements of the proposed workflow.

Methodology:

This needs significant change. Sections 2, and 3 to be included under methodology and reduced considerably. Since the main message of the paper is the workflow and not the development of the individual methods such as DisPat MPS algorithm, the mathematical formulations have to be reduced and only leave the main one which represent the approaches. This paper doesn't need to illustrate how the mathematical formulation for the used approaches developed.

In sections 2, and 3 it is unclear at the end which approaches has been selected by the authors. Methodology part must include clear sentences on what method has been used by the authors at the end of each part.

Methodology part also lacks proper explanation for soft and hard data preparation. This

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is also part of the methodology. Approaches used for deterministic seismic inversion, spectral decomposition, and property classifications (e.g. porosity) are to be described briefly under methodology. So the methodology section has to be revised and new one includes: 1-MPS 2-Model selection 3-Soft and hard data preparation.

Illustrations:

Figures need to be improved to support the conclusions given in the paper. Figures lack scale, orientation, and in some cases, proper annotations. More comments on individual figures are given in the pdf file. On figure showing some representative well logs is needed in order to confirm the interpretation of delta type reservoir claimed in the paper. It means that wells that show the fluvial facies that has been interpreted on inverted and decomposed seismic data.

The discussion part of the paper has a lot of overlap with the results.

All in all the manuscript has certainly the good material to be published and it is not a difficult task to include the comments above and those mentioned in the pdf file in order to convey the main message of the paper.

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