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Interactive comment on "Surf3DNet1.0: A deep learning model for regional-scale 3D subsurface structure mapping" *by* Zhenjiao Jiang et al.

Anonymous Referee #1

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General comments: This manuscript proposes a deep CNN with joint autoencoder and adversarial structures to predict the probability of subsurface palaeovalleys (derived from airborne electromagnetic data) using 2D land surface tomography. It has been claimed that the trained model "produces a square error < 0.10 across 93% of the validation areas". The prediction error contradicts the conclusion of a reliable model in reconstructing 3D palaeovalley patterns. This is consistent with the results in Figure 3. If we compare Figures 3d and 3f, it is quite clear that many structures that are present in the real 3D image are missing from the simulated image and indeed these two images are not similar. On the other hand, Figure 3c and 3e are very similar (Training set). This simple visual comparison reveals that the trained model is very overfitted and contradicts the claim of similar performance in training and validation areas (Abstract:

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"The trained neural network has a maximum square error < 0.10 and produces a square error < 0.10 across 93% of the validation areas"). I highly recommend the authors to provide more evidence on the performance of the proposed model in validation areas. A 3D map showing the spatial distribution of errors (for both validation and training areas) would be useful.

Specific comments: The proposed model is used for subsurface structure mapping. Sub3DNet might be a better name for the model. It is good to discuss some of the limitations of the deep CNN models. For instance, too many structures are available (e.g., number of convolutional and pooling layers) and it is not clear which structure is the best for the study presented in this manuscript.

Technical corrections: No technical correction is needed at this stage.

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