

Impact of seismic image quality and presentation on interpretation uncertainty

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Uncertainty in interpretation of a seismic image can have a strong economic impact in subsurface resource exploration. In this work, we analysed results from two experiments on seismic interpretation, to determine the effect of seismic image quality and image presentation on the participants' perception of the interpretations. In the first experiment, we analysed fault interpretations carried out by 196 participants for a seismic image, presented both in two-way traveltime (TWT) and as a depth-converted image. The depth conversion applied stretched the image and reduced the image contrast and reflector continuity. Using image analysis techniques we have quantified the differences in contrast and continuity of the TWT and depth images, creating colour maps of image quality to compare with the spread in the interpreted fault populations. The experiment results show that low contrast and continuity areas correlate with a greater range of interpreted fault geometries, resulting in a broader spread of fault interpretations in the depth image. Analysis of the results strongly suggest that differences in image contrast and reflection continuity can form artificial (i.e. not data-constrained) boundaries that impact interpretation outcome. This information can be used to inform areas in an interpreters model where interpretation risk maybe high, and where interpretation and structural modelling efforts should be focused. In the second experiment, we tested the effect of presentation ("framing") on confidence in the interpretation of seismic images. The 761 experiment participants were presented with seismic images and interpretations, modified to introduce potential framing biases. Statistical analysis of the results show that image presentation had a subdued effect on participant's confidence compared to the quality of the seismic data and of the interpretation, but its effect cannot be neglected. Thus, we propose recommendations regarding the presentation of seismic interpretation results aimed to minimise biases in the observers. The results of these two experiments show that seismic image quality and presentation can have a strong impact on the interpretation of seismic images.