Submission code: ZJGPRK8546

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Pseudo3D Workflow for Converting Legacy Brazilian onshore 2D Data into 3D Volumes - Something out of Nothing or a Step Change in Subsurface Machine Learning Applications?

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Introduction

We are presenting a novel workflow for converting a set of 2D data, in the form of 2D seismic lines, into a 3D volume. A case study from onshore Brazil is presented where available 2D line data is used for the conversion to Pseudo3D. Data is also put aside to be used as a blind test to validate our results. We showcase that Pseudo3D can aid in interpretation, especially for advanced interpretation workflows that are optimized for 3D or available for 3D data only.

Methodology

The first step in our workflows pertains to mitigating mis-ties across the available 2D data, as this has proven to be paramount for a successful conversion into Pseudo3D. Where mismatches occur, our stratigraphic framework will contain unwanted loop-skips which will then in turn affect the outcome in a negative manner. After mis-tie analysis and rectification, we apply tried and tested gridding methods, mainly by using nearest neighbor interpolation to bring the 2D data into the 3D space. The initial, ‘blocky’ result is then in turn enhanced by structurally oriented filtering to better follow the actual geologic dips, in accordance with regionally mapped sequence boundaries. The machine learning method we use learns from the existing 2D data and can ‘extrapolate’ this information out into 3D space, where the Pseudo3D traces will then be predicted. The final step is to spectrally enhance the 3D volume, within the bandwidth limits of what is known from either the existing 2D data or well data in the vicinity.

Results and Conclusions

We present a case study from onshore Brazil, where we utilize a set of 2D lines to generate a Pseudo3D volume. The resulting dataset will then be subject to several validation processes in order to ensure prediction error mitigation. Our aim is to be able to create usable 3D volumes that can then in turn be subject to further analysis using 3D tools that have previously had to be discarded due to the limits of available datasets.