**Abstract**

3D seismic data has been shown to be an excellent tool when studying large-scale folds and thrust belts generated by underwater gravity-driven movements, particularly when the focus is the linkage between proximal (extensional), external (contractional), and lateral (transcurrent) domains. The Maricá is a Maastrichtian (~65 M.a.) detached mass-transport complex, located 150 kilometers from the city of Rio de Janeiro, which has an area of 1015 m² and an average thickness of 150 meters. The present study focuses on understanding how the internal structural geometry is spread over the Maricá mass-transport complex and how this geometry varies across the different domains via 3D characterization and well data. The research provides visual characterization showing the relationship between structures and lateral variations within the complex. The first step focused on seismic interpretation of the chaotic horizons. A progressive internal disaggregation was identified, with the proximal domain showing normal faults and the external domain showing folds and thrust faults. The external domain also shows folding and thrusting, a response of the presence of a salt wall located at the toe of the complex. We were able to identify that the long axis of the rafts stays parallel to the Southwest flux direction, however in circumstances when compression is present, the axis tends to be perpendicular to the flux direction. The second step will focus on well data, where resistivity image logs will be interpreted to link seismic scale to well scale. The data was provided by the National Agency of Petroleum, Natural Gas and Biofuels (ANP) through a request at ANP’s Exploration and Production Database. The complete 3D characterization serves as a reference when studying deformed regions with outcrops lacking quality or quantity providing foresight regarding lateral continuation. These results will assist future studies on outcrops and underwater mass-transport complexes because they are frequently present in many basins across the world, including those with petroleum exploration.

**References Cited**


Abstract

3D seismic data has been shown to be an excellent tool when studying large-scale faults and thrust belts generated by underwater gravity-driven movements, particularly when the focus is on the linkage between proximal (extensional), external (contractional) and lateral (transcurrent) domains. The Maricá is a detachment-type (~65 M.a.) detached mass-transport complex, located 150 kilometers from the city of Rio de Janeiro, which has an internal geometry that has great relevance to the whole Maricá mass-transport complex and how this geometry varies across the different domains via 3D characterization and well data. The authors would like to thank ANP for providing the seismic and well data and dGB Earth Sciences for providing an OpendTect academic.

Results

0.125s

0.125s

0.250s

Amorphous chaotic seismic-facies

headwall domain

translational domain

toe domain

Figure 1. Location figure as well as magnetic map showing the location of the 2D seismic lines and the area used during this study. Silva et al. created a stratigraphic chart showing the period of time when the water complex was triggered and deposited.

Maricá Mass-Transport Complex (MMTC)

Figure 2. 3D seismic line showing the general aspects of the MMTC. It is possible to identify the three different domains, commonly described in literature. The headwall domain is defined by a strong to weak linear positive contrast and has a similar dip angle with the seismic facies underneath. The transitional domain is characterized by a strong positive contrast and uniform dip with a change in acceleration and velocity of the chaotic flow. The toe domain is characterized by the obstruction of the flow due to a salt wall. Internally it is possible to identify different chaotic seismic facies within the MMTC. An important placed especially at the transition between the headwall and the translational domain. It is located instantly to the NNW SSE axis direction. Layers C and D, which can be divided into having a short-length and a long-length.

Figure 3. Neural Network training using a Vshale calculated log and the seismic reflectors. The Neural Network shows the variance of argilosity between the different areas of the MMTC. It is possible to identify that the proximal area has more sand when compared to the distal areas. This work is an attempt to map the margins of the mass-transport complex by the presence of the seismic facies. The Neural Network is used to classify the chaotic seismic facies. It is possible to identify an enrichment of shaly lithologies. When looking at the layered chaotic seismic facies it is possible to identify an enrichment of sand-rich lithology. When looking at the layered chaotic seismic facies it is possible to identify the parallelism of the facies below it. The toe domain is characterized by the obstruction of the flow due to a salt wall. Internally it is possible to identify different chaotic seismic facies within the MMTC. An important placed especially at the transition between the headwall and the translational domain. It is located instantly to the NNW SSE axis direction. Layers C and D, which can be divided into having a short-length and a long-length.

Figure 4. Flat scan using the base surface of the MMTC as reference. This figure shows the pre-existing configuration when the complex was triggered and deposited (Maastrichtian). It is possible to identify that there was a major topographic feature (green arrow) that controlled the deposition. This topographic feature caused a change in the acceleration and velocity of the flow, resulting in the different chaotic seismic-facies. The presence of the topographic feature caused the deceleration of the flow, resulting in the different chaotic seismic-facies. The presence of the topographic feature caused the deceleration of the flow, resulting in the different chaotic seismic-facies.

Conclusions

The topographic feature had a significant role in controlling the internal architecture of the complex as well as the morphology of the overlying rocks.

References


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