

# Offshore®

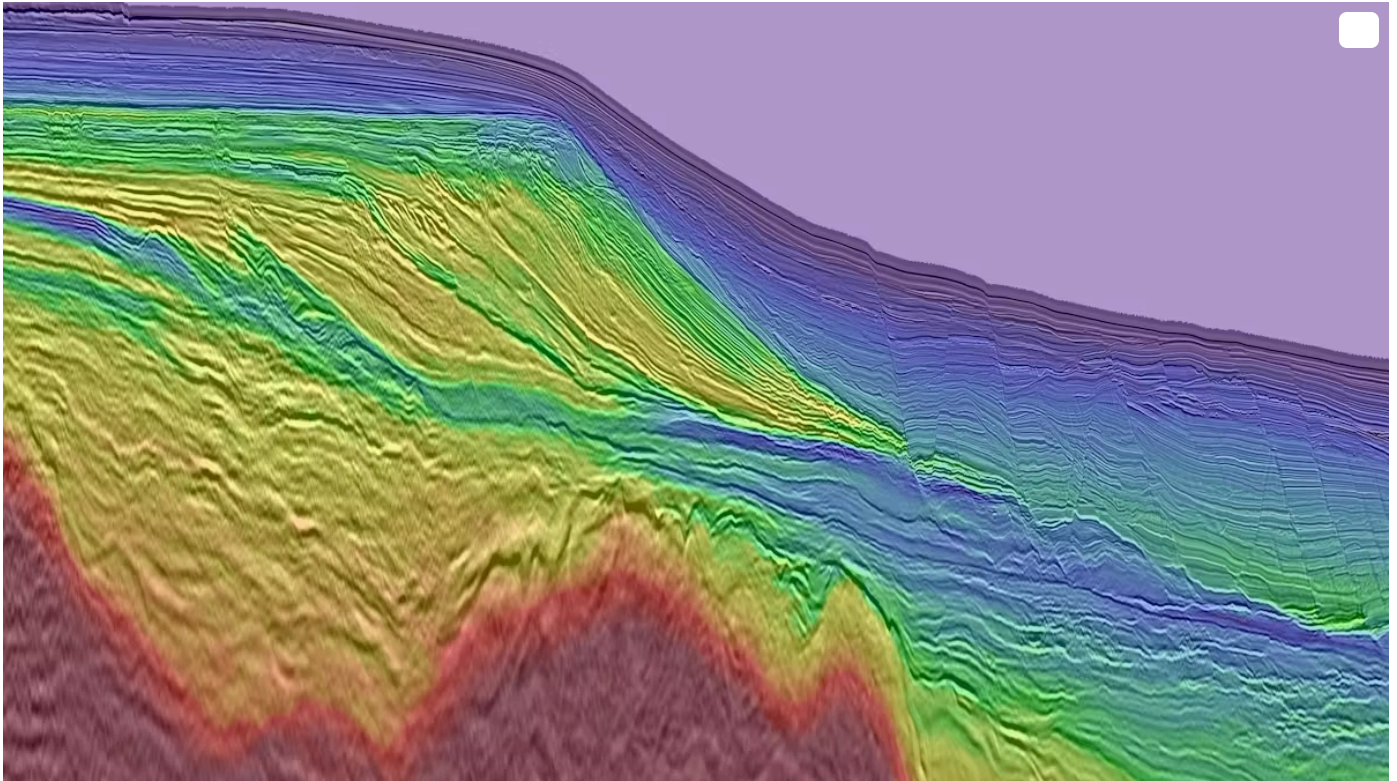


Figure 1. A seismic section from Amapá Phase I displays an FWI-derived velocity overlay. The carbonate platform and its evolution—linked to global sea-level changes—are clearly visible. Enhanced resolution beneath the platform and in deeper intervals reveals potential reservoir facies as negative amplitude anomalies and channelized geometries within the Cretaceous.

## GEOSCIENCES

# Seismic imaging reveals hidden potential of deepwater Foz do Amazonas Basin offshore Brazil

Advances in seismic imaging are proving critical to unlock the hydrocarbon potential of promising frontier basins.

## Key highlights

- Seismic reimaging and new data acquisition have significantly improved the understanding of subsurface geology in the underexplored Amapá Deep Water region.
- High-resolution seismic imaging techniques, such as elastic FWI, provide detailed velocity models crucial for frontier exploration in areas with sparse well control.
- Enhanced imaging has enabled detailed mapping of depositional features and identification of hydrocarbon indicators like bright spots and amplitude anomalies.

*By Eduardo Leaubon, Viridien*

Exploration activity along the Equatorial Atlantic Margins has intensified in recent years, driven by major oil discoveries in the Guyana-Suriname basins, where proven reserves now exceed 18 billion barrels. However, the Brazilian sector of this margin—particularly the Amapá Deep Water province within the Foz do Amazonas Basin—remains largely underexplored.

Fewer than a dozen offshore wells have been drilled in shallow waters of this area, with most relying on legacy seismic datasets acquired decades ago. Even so, industry interest remains strong, as seen in [the latest bidding round](#) where US and Chinese companies secured 19 new exploration blocks in the basin.

Several companies continue to invest in the Brazilian Equatorial Margin, recognizing its significant hydrocarbon potential.

## Amapá Deep Water area seismic reimaging

New initiatives in seismic reimaging and acquisition have applied cutting-edge technologies and advanced imaging workflows. By upgrading legacy datasets and acquiring modern seismic data, previously unseen prospectivity has been revealed.

Three key surveys covering the Amapá Deep Water area combine reimaged legacy data (Phase 1) with new acquisition (Phase 2), along with a merged reimaging of three older surveys into a single enhanced dataset.

These surveys\* have been imaged using the latest algorithms, including elastic full-waveform inversion (elastic FWI), which delivers ultrahigh-resolution velocity models. These models are vital for imaging subsurface geology in frontier regions with sparse well control, like the Foz do Amazonas Basin.

## **Mapping the Upper Cretaceous and beyond**

The high-resolution seismic has enabled semi-regional interpretation with impressive accuracy, even across complex geological intervals and at greater depths. The main focus of exploration in this area is the Upper Cretaceous, which shares similarities with plays in Guyana and Suriname. Here, turbiditic reservoirs on the slope and basin floor are believed to have been charged by an exceptionally rich source rock deposited during the Albian–Cenomanian–Turonian oceanic anoxic event.

The improved imaging has made it possible to map depositional features such as channel levee systems, lobes and other turbiditic geometries in detail, reconstructing sediment transport systems and paleoenvironments with a higher degree of confidence.

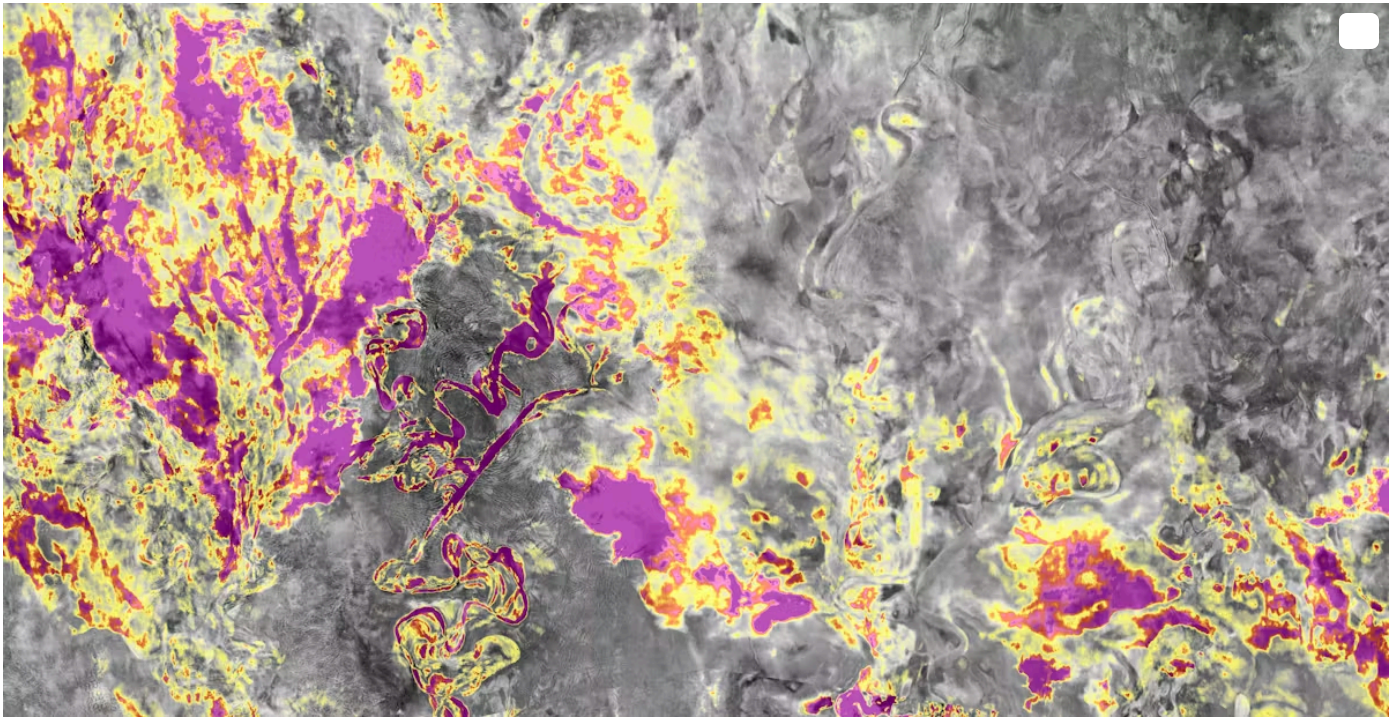


Figure 2. From a new seismic volume, a basin floor fan system is interpreted within an Upper Cretaceous interval in the deepwater offshore Amapá (Foz do Amazonas Basin). The image shows several negative amplitude anomalies, interpreted as turbiditic features—including channels and lobes (fans)—highlighted in yellow to purple tones.

Additionally, attribute analysis and AVO methods applied to the reimaged volumes have identified Class III AVO anomalies, consistent with hydrocarbon presence. Several direct hydrocarbon indicators, such as bright spots and amplitude anomalies, align with prospective geometries in the Upper Cretaceous section, significantly reducing exploration risk.

The benefits of seismic reimaging extend beyond Cretaceous targets. Interest is also growing in younger, Cenozoic-age plays, including systems associated with the Amazon Submarine Fan, as seen in the latest bid round. Prospects mapped in these intervals suggest further upside potential, pending the results of ongoing seismic acquisition programs.

## Frontier exploration and the future of the Foz do Amazonas

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Nov. 18, 2024

With momentum growing across the Brazilian Equatorial Margin, the Foz do Amazonas Basin is emerging as one of the country's most promising frontier opportunities. High-resolution seismic imaging—combined with advanced interpretation techniques—is transforming legacy data into actionable insight, supporting more confident exploration in geologically complex settings.

Looking ahead, continued integration of machine learning, AI and quantitative interpretation tools, robust exploration workflows and new acquisition will further refine lead evaluation and accelerate discovery potential.

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*\*The data shown in this article is part of a collaboration between Viridien and TGS.*

## About the Author



### Eduardo Leaubon

Eduardo Leaubon is an exploration geoscientist with Viridien's Earth Data team where he specializes in seismic interpretation of Brazil's frontier basins. He holds a geophysics degree and is currently studying for a master's in geology. He previously worked for ANP, contributing to block definition for Brazil's Permanent Offer rounds.

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