

Subsalt Imaging

One of the more perplexing areas in E&P is subsalt exploration and reservoir development. While the potential yield is great, the salt layer poses unique imaging challenges. A major offshore E&P operator with a vast portfolio of acreage in the Gulf of Mexico and offshore regions of West Africa, Brazil, and the Mediterranean faced a decision to either relinquish or extend their leases on soon-to-expire acreage, or acquire offset blocks. The acreage was believed to be highly prospective but difficult to image, as many targets were obscured by salt. Through a multi-year RTM alliance with ION's GX Technology group, coupled with leveraging ION's BasinSPAN™ data library, the operator was able to gain the subsurface images required to de-risk their exploration portfolio.

COMPLEX GEOLOGIES

Subsalt Imaging

Challenge: Identify drillable prospects in a subsalt-intensive portfolio.

Approach: Multi-project 'alliance' applying reverse time migration (RTM).

Result: Clearer subsurface images help de-risk exploration portfolio.

LARGE PORTFOLIO OF HARD-TO-IMAGE, HIGH-POTENTIAL SUBSALT ACREAGE

One of the world's most technologically sophisticated offshore operators had compiled a large portfolio of proven and undeveloped acreage in the Gulf of Mexico and offshore regions of West Africa, Brazil, and northern Africa. The acreage was believed to be highly prospective, but the potential reservoir targets in many areas were difficult to image as they frequently were overlain by regional salt bodies or extensive salt sheets.

In addition to the imaging challenges, the 'clock was ticking' for the E&P operator as they had lined up deepwater drilling capacity to test their highest potential prospects and, in some areas, faced a tough decision among the options of relinquishing soon-to-expire acreage, extending their leases, or 'doubling down' by acquiring offset blocks.

The company, which had been so successful in obtaining lease positions in some of the most promising and prolific hydrocarbon basins in the world, quickly formulated a plan to progress leads to drillable prospects within their exploration portfolio and further high-grade the portfolio in order to commit their budgeted capital to the best prospects.



COMMITTING TO A MULTI-PROJECT 'ALLIANCE' BASED ON REVERSE TIME MIGRATION

This E&P operator had been one of the earliest proponents of reverse time migration (RTM) as the next evolution in pre-stack depth migration (PreSDM). As early as 2005, they were working with ION's GX Technology (GXT) group to refine and commercialize the technique.

As an early adopter of RTM, this E&P operator was keenly aware of the advantages that RTM could bring to structurally complex imaging situations, including reservoir targets that were adjacent to or beneath the salt. Moreover, they had witnessed first-hand the 30x improvement in efficiency that GXT had achieved in implementing the computationally intensive RTM algorithm. Confident in ION's ability to provide much needed data, the E&P operator committed to a multi-year RTM alliance with GXT.

"GXT's RTM techniques have proven invaluable in our exploration and development programs in the Gulf of Mexico and other areas."

– Senior VP - E&P Technology,
Integrated Oil & Gas Company

ION TECHNOLOGIES HELP DE-RISK EXPLORATION PORTFOLIO

ION helped this E&P client better understand the risks and opportunities associated with its exploration portfolio around the world. At a macro-level, by accessing portions of ION's BasinSPAN™ data library, the New Ventures team within this E&P operator was able to develop holistic, basin-scale insights about entire petroleum systems. They are using these insights to determine which global petroleum systems around the world to enter or exit and to optimally allocate their exploration investment among the basins in which they already operate.

Within the Gulf of Mexico, the client's Exploration teams have been able to leverage their RTM alliance with GXT to rapidly assess their undeveloped acreage position, make key decisions about leasehold acquisition (and divestment), and rapidly progress exploration concepts and leads into a prioritized set of near-term drillable prospects. The structure of the global, multi-project alliance, along with GXT's pioneering implementation of the RTM algorithm, has allowed the client's Exploration teams to rapidly assess their opportunities on several hundred subsalt lease blocks held in the

Gulf of Mexico. Moreover, RTM and additional geophysical studies have enabled the client to better characterize assets that already have been discovered and, in so doing, optimize their appraisal, development, and reservoir management programs.

CONTINUED RTM LEADERSHIP

Since commercially introducing RTM, GXT has increased its compute power to deliver the fastest RTM code in the industry and has applied its advanced RTM technique to over 100 projects worldwide, including in the Gulf of Mexico, North Sea, the South Atlantic basin, and offshore West Africa. Most recently, GXT introduced RTM³ – Real-time Model Morphing and Migration, a revolutionary velocity modeling tool that lets interpreters test 'what if' salt model hypotheses using RTM in a matter of hours rather than weeks.

RTM³: REAL-TIME MODEL MORPHING AND MIGRATION

As the challenges for imaging subsalt reservoirs become more complex, E&P companies continue to look for fast and efficient ways to reduce their risk and improve drilling success. To enable interpreters to test what-if scenarios in a matter of hours, GX Technology developed RTM³, a suite of tools that allow salt models to be modified very quickly within the RTM software.

Salt body modifications include:

- Addition of inclusions
- Modification of salt wing and keels
- Weld thickness

FEATURES AND BENEFITS OF RTM³

- **Streamlined production** – Our specialized front end streamlines the job submission and parameterization process, without sacrificing image quality.
- **Intuitive modeling tools** – Leveraging the speed of our RTM technology, RTM³ builds most 'what if' scenarios a few hours. Drilling teams can use RTM³ as a valuable tool in their planning process.
- **3D model morphing** – Codes can be expanded to work with many types of salt body modifications. All the model morphing tools are designed to work in 3D, enabling rapid model changes and enhanced modeling flexibility.
- **Remote access** – Users enjoy fast, easy, and secure access to their data from their offices.
- **Full frequency, full aperture** – Users experience all the production benefits of RTM.



ABOUT ION

ION Geophysical Corporation is a leading provider of geophysical technology, services, and solutions for the global oil & gas industry. ION's offerings are designed to allow E&P operators to obtain higher resolution images of the subsurface to reduce the risk of exploration and reservoir development, and to enable seismic contractors to acquire geophysical data safely and efficiently.

To learn more about how ION helps oil & gas companies and seismic contractors solve their toughest imaging and operational challenges, visit us at iongeo.com.

ION Geophysical Corporation
2105 CityWest Blvd., Suite 400
Houston, TX 77042
Phone +1 281 933 3339
Fax +1 281 879 3626
iongeo.com