

The Faroe Islands A New Beginning

Exploring the Faroese Continental Shelf for almost 20 years has taught the geoscientists working on the area some important things. Firstly, they know there is an active hydrocarbon system in the area; furthermore, multiple large structures have been confirmed in the region but exploration has also shown that the area has a complex volcanic history.

Since the first three of a total of nine offshore wells were drilled in 2001, great improvements have been made in drilling technology as well as major steps forward in seismic methods, which give the opportunity to image deeper and in more detail than previously. Drilling in basalt has undergone an impressive development,

increasing the rate of penetration from one to ten meters per hour. All these improvements have come about after a lot of effort and are the result of significant scientific developments.

Lessons Learned and New Ideas
Exploration on the Faroese Continental Shelf has shown that previous interpretations underestimated the thickness of the volcanic section, but drilling through the basalts has been found to be less complicated than initially anticipated. It has also shown that the Vailla play type known from the West of Shetland is more complex on the Faroese Continental Shelf than previously thought, but there is evidence that the interaction

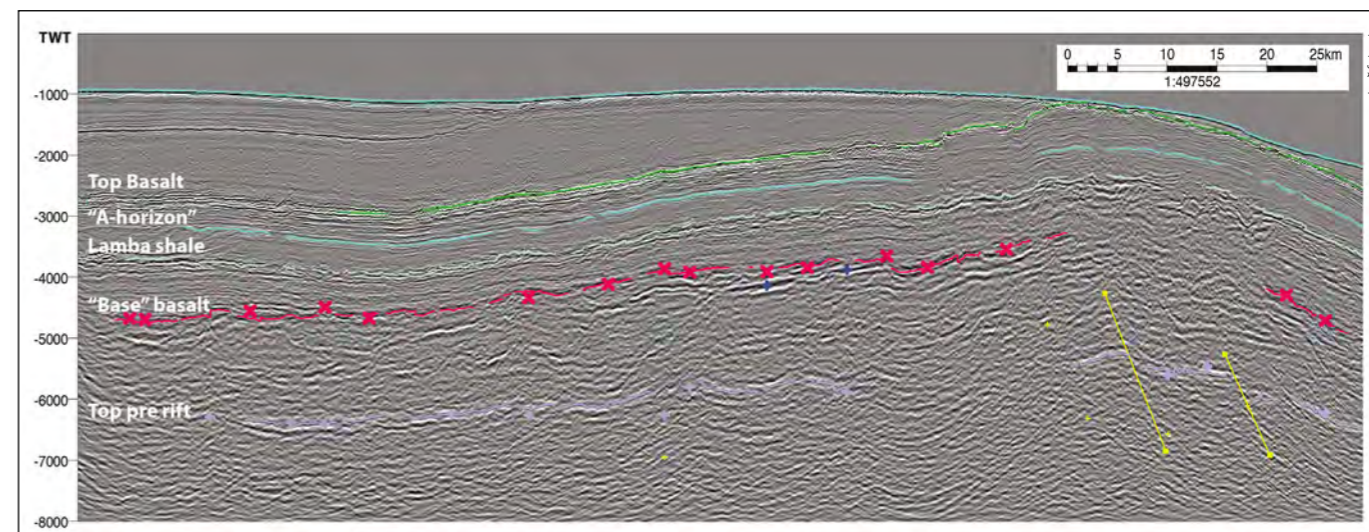
The 4th Faroese Licensing Round offers a new beginning for exploration in this North Atlantic archipelago, with a better understanding of the geology and a wealth of improved data now available.

ÓLUVA EIDESGAARD, Jarðfeingi

between the siliciclastic sediments and the volcanic cover can open up new structural and stratigraphic play types.

With this improved vision geoscientists at the Faroese Geological Survey (Jarðfeingi) are now revisiting the large amount of data available at the Jarðfeingi data repository in order to achieve a regional update of the eastern part of the Faroese Continental Shelf before the opening of the 4th Faroe Islands Licensing Round on May 17th, 2017.

The widespread volcanic cover has had a large impact on the Faroese Continental Shelf, but with improved data and additional knowledge from the nine offshore exploration and the three onshore scientific wells, geoscientists



Interpretation of recent seismic shows how it is possible to image deep into the basalt with the new data. This seismic line crosses one of the largest structures on the Faroese Continental Shelf.

are now gaining a better understanding of the volcanic history. With a superior grasp of the relative ages of the different volcanic phases it is possible to gain greater knowledge about the volcanic development, the tectonics associated with it and the thermal impact it has had on the different areas. With this knowledge it is also possible to see where and when the source rock has been affected and hopefully by how much. Based on improved seismic data the geoscientists have also been able to gather more knowledge of the relative ages of the tectonic phases in the area. Combining this intelligence with better information on source rock maturity means there should be sufficient material to try to understand the underlying hydrocarbon potential, including possible migration pathways and the timing of structural evolution, which should result in the identification of the key elements which will indicate the presence of interesting plays.

The work being undertaken by the Faroese geoscientists is divided into three main areas: a reassessment of the hydrocarbon system in the region, a fresh look at all available reprocessed seismic data, and a renewed examination of the volcanic history.

Deeper Structures and Sources

The initial results from the renewed look at the hydrocarbon system has already given us a better idea of the distribution of the Kimmeridge Clay Formation, which is the primary source rock in the area. Together with the new seismic interpretations, which in areas has given information on pre-rift structures and base volcanics, Jarðfeingi now has more data than previously on the distribution of the pre-volcanic sediments such as possible Upper Jurassic source rocks in parts of the area. Heat flow history, source rock maturity and possible migration

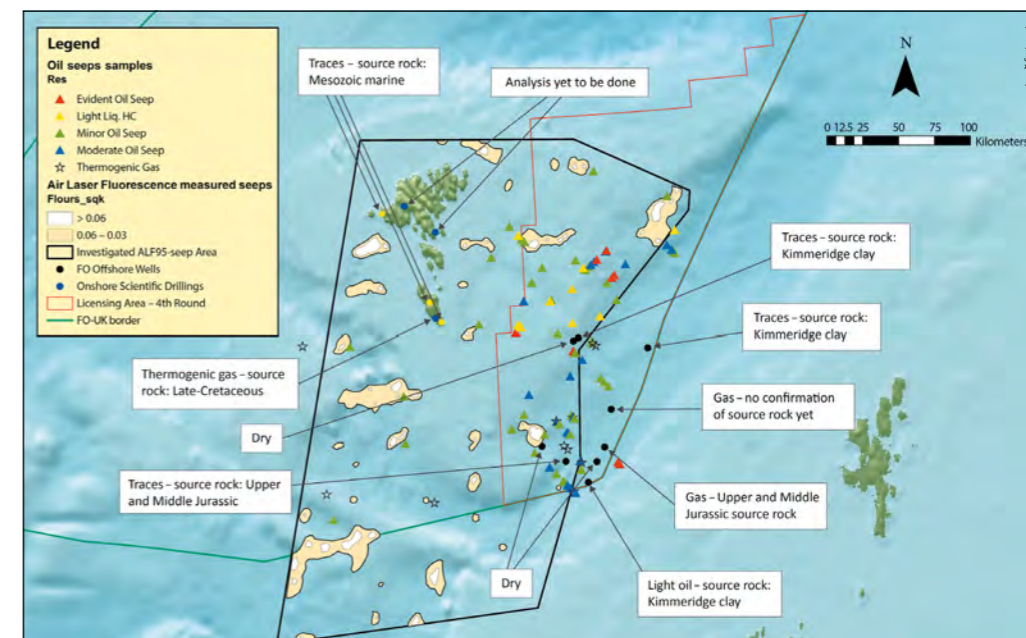
pathways are also being looked at.

With improved seismic, not only can deeper structures and horizons now be seen, but also more detailed intra-volcanic structures. This opens up the possibility of understanding the intra-volcanic play types as well as the interaction between the volcanics and the siliciclastic sediments at their base and at the point where the volcanic cover meets the siliciclastic material from the east. In both cases these are areas where there is potential for both structural and stratigraphic plays. This work has already provided us with a better picture of some of the deeper

Gáshólmur and Tindhólmur on the western side of the Faroe Islands with the islands of Vágar and Streymoy behind.



A seep data map showing all available data from the Faroes Continental Shelf including onshore Faroe Islands. The map is based on an Air Laser Fluorescence survey, a seabed core survey and source rock data from the nine offshore wells, in addition to outcrop samples and one deep onshore well.



Exploration

large 4-way dip closed structures previously known in the area, and it has also opened up interesting play types at the border between the volcanic and siliciclastic units on the eastern edge of the Faroes Continental Shelf.

An improved understanding of the tectonics in the area is also a key factor because better knowledge of the relative age of the structures and their timing will help determine whether or not the structures were present after expulsion of the hydrocarbons below and therefore if they could have acted as a hydrocarbon trap.

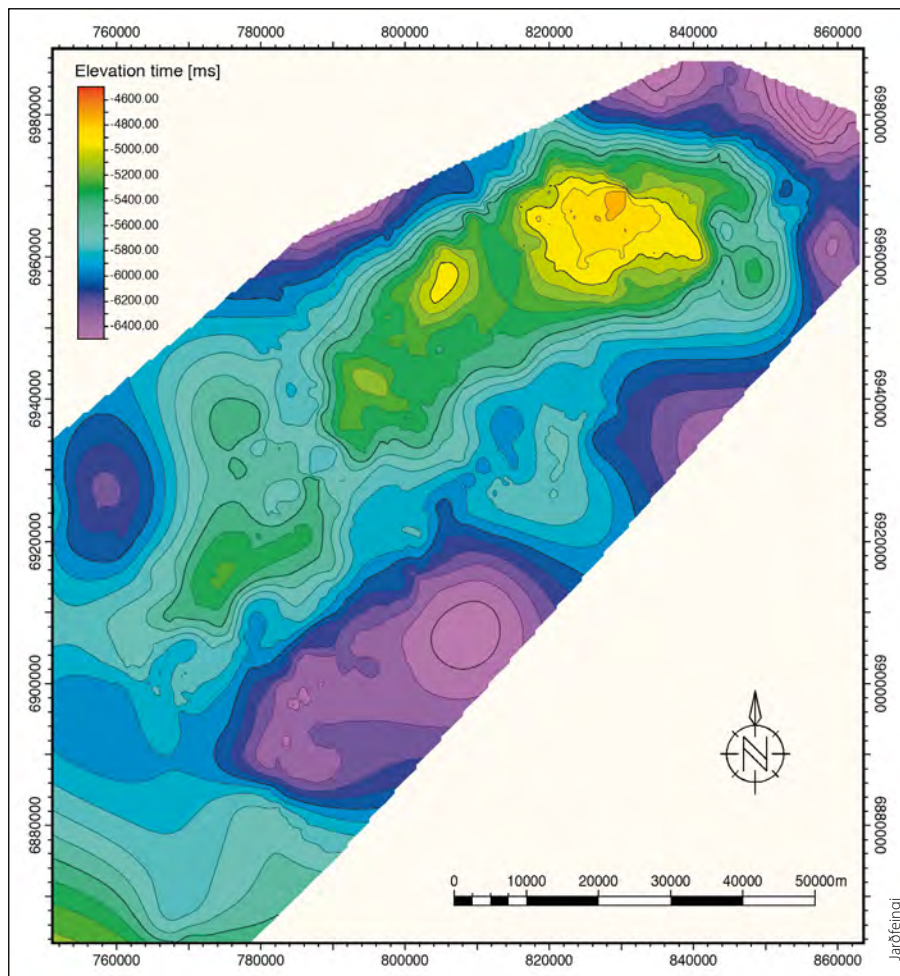
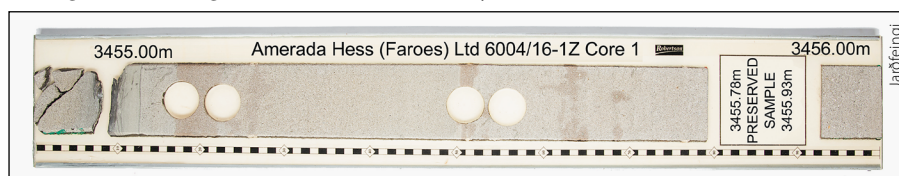
Revisiting the Volcanic History

A comparison study between the well data interpretations and the cores and cuttings from the volcanically influenced horizons has been undertaken in order to create a new and better understanding of the volcanic history. Together with a detailed study of the seismic facies distribution of the volcanic sequences on the Faroes Continental Shelf, this work will give a better and more detailed knowledge of the geology of the area. These new ideas will help us comprehend the various phases and regional differences in the distribution of the volcanic facies. The new maps will also give the depth conversions of the regional seismic horizons better quality control.

Understanding the regional distribution and relative timing of the various volcanic facies will also improve the knowledge of their thermal impact on the hydrocarbon system in the region.

Greater comprehension of the timing of the different phases of the volcanic complex will also provide the opportunity to learn more about the tectonic development of the area. This can again give ideas on the relative age of the structures and the possibility of the presence of structures which could act as traps for capturing the migrating hydrocarbons from below.

The only discovery on the Faroese Continental Shelf was made in well 6004/16-1/1z (Marjun), which is thought to contain light oil. The oil stains are clearly visible in the core.



Map showing the pre-rift horizon in the same area as the seismic line on the previous page. The map is in two-way time.

Furthermore, probing the data repository of cores and cuttings for lithological and geochemical signatures of the basaltic lava sequences will also allow for new correlation between the well-known onshore volcanic stratigraphy and the offshore sequences, thus affording better chronostratigraphic control.

May Conference to Unveil New Ideas

The upcoming 4th Licensing Round is only the beginning of a new proposed licensing strategy. While the area south-east of the Faroe Islands is included in this round, preparations for a 5th Licensing Round on the western side of the Faroe Islands are underway. The aim

is to open this in 2019, followed by a 6th Licensing Round in 2021, when the plan is to include the remaining area of the Faroese Continental Shelf.

During the 5th Faroe Islands Exploration Conference, which will be held in Tórshavn from May 16–18, 2017, all new data together with the results of the recent work undertaken by Jarðfeingi and collaborators will be presented. Depth maps to key horizons such as base volcanics and pre-rift, together with, if possible, paleoenvironmental, heat flow and source rock maturity maps will also be presented, as well as suggested leads and play types. During the conference, a core store will be open, where it will be possible to look at the cores from previous exploration wells, together with a description of each core. There will also be a data room facility open for attendees, which will be available to interested oil companies throughout the round. ■