Discover more in Møre, Norway

Connecting the North and Norwegian Seas by extending proven and developing play models

As demonstrated by recent exploration success, Viridien's Northern Viking Graben (NVG) seismic survey in the Northern North Sea has already proven to be a valuable exploration tool. Thanks to the high-quality seismic data in this geologically challenging area, prospects are better defined, allowing for qualified drill decisions. In 2024, Viridien applied the latest seismic acquisition and imaging technology to add a northern extension, known as NVG24 (green polygon in Figures 2 and 3), to its current coverage over the NVG so that it now extends into the Møre Basin and Møre Platform in the Norwegian Sea. A glimpse of the early fast-track data from NVG24 is shown in the foldout juxtaposed with fully imaged data from the NVG East-West (EW) coverage (Figures 2 and 3). The upcoming NVG24 final data will be of the same high quality and reveal structural and stratigraphic details at the Manet Ridge, Marulk Basin, Gnausen High and the Møre Platform (Figure 3).

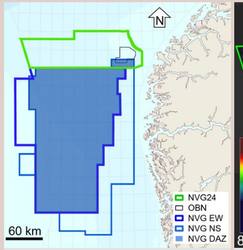

Figure 2. Overview map of the NVG survey (blue), NVG24 (green) and sparse OBN (black) coverage near the Norwegian coast.

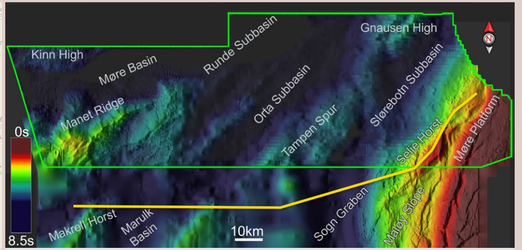

Figure 3. Time-structure map of the top acoustic basement in the Møre Basin, Sogn Graben, and Møre Platform. The green polygon is the NVG24 survey. The yellow line is the location of the seismic foldout line in Figure 1.

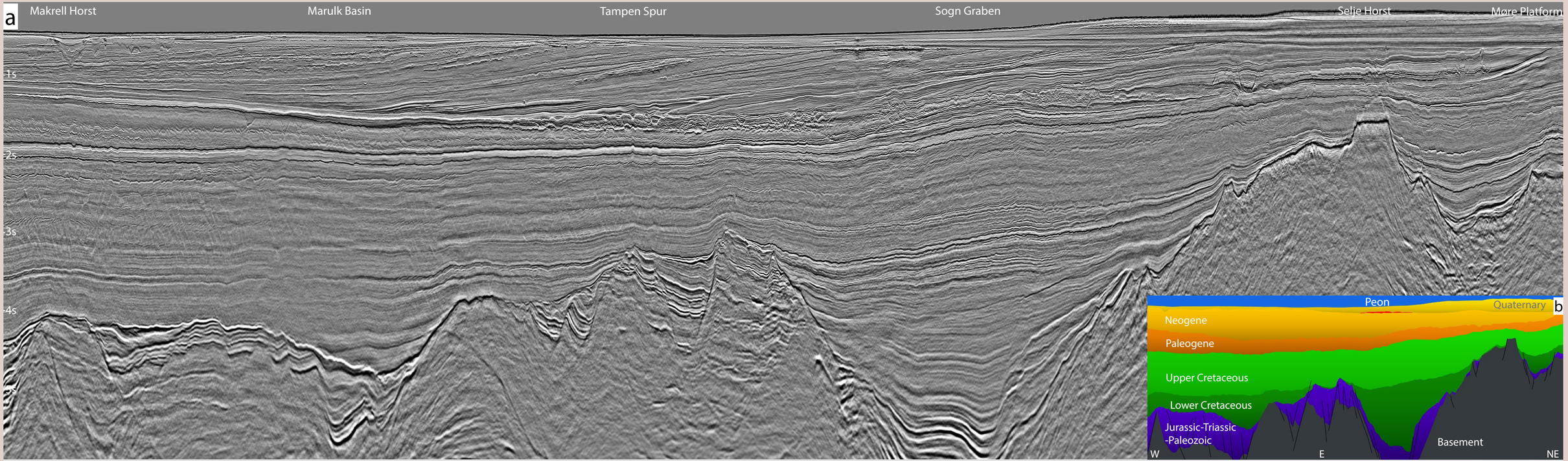

Figure 1: (a) Seismic section across the NVG final data and the recent NVG24. The vertical scale is in two-way traveltime.
(b) Coloured interpretation of the seismic foldout line. The line location is indicated in Figure 3.

New seismic data unlocks Møre Basin reservoirs

Do the Møre Basin and Platform hold the next hydrocarbon giants on the Norwegian Continental Shelf?

MARIT STOKKE BAUCK, ANNA RUMYANTSEVA AND IDAR KJØRLAUG, VIRIDIEN

VIRIDIEN'S Northern Viking Graben (NVG) seismic survey campaign in the North Sea recently celebrated 10 years of acquisition and imaging (Figures 1 and 2). Since its commencement in 2014, the survey has played a significant role in exploration in the Norwegian North Sea area. With the latest survey extension northwards, known as the NVG24 dataset, the NVG survey now covers parts of the Møre Basin and its bounding structures, the Marflo Spur, Kinn High, and the Møre Platform in the Norwegian Sea. The regional foldout line from the NVG survey intersects some of these structures (Figures 1 and 3). The first phase of exploration activity on the Møre margin was driven by the desire to investigate the possible extension of the Jurassic-rotated fault blocks already successfully targeted in the North Sea. So far, the wells drilled have found only minor amounts of oil and gas in Jurassic and Cretaceous reservoirs. However, it was the presence of hydrocarbons and reservoirs on the Manet Ridge and Møre Platform that encouraged Viridien to extend the NVG survey northward into the less explored Norwegian Sea and acquire the NVG24 data set (Figures 2 and 3). The streamer survey was acquired in an east-west direction with a broadband configuration. In the east, a grid of sparse ocean bottom nodes (OBN) was deployed; these results will be available later in 2025. This article outlines potential reservoirs that can be mapped with the new NVG24 imaging.

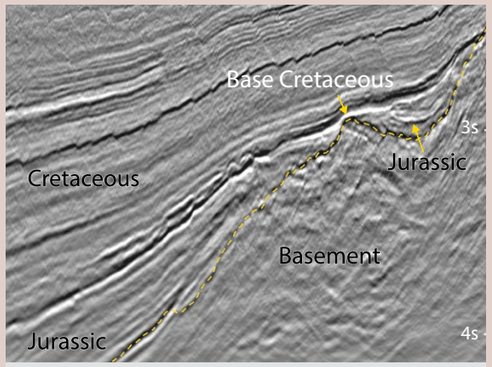

Figure 4: E-W seismic section across the Møre Platform and Slørebotn Subbasin. The yellow dashed line represents the top Basement, which is covered in Triassic and Jurassic deposits.

RESERVOIRS AND PLAY MODELS

MESOZOIC RESERVOIRS

Classic Mesozoic plays are seen both near the Manet Ridge in the west, extending north toward the Møre Basin, and in the near-shore structures on the Møre Platform in the east. These hold the potential reservoirs of Triassic and Jurassic sands. A three-way closure prospect in the Marulk Basin, toward the Manet Ridge, has possible reservoirs which are time-equivalent to Triassic-Jurassic Lunde and Statfjord formations (Figure 1).

The early NVG seismic survey vintages revealed half grabens with Jurassic deposits within the Måløy Slope. Similar half-grabens are found within the Møre Platform, which can be seen as a continuation of the Måløy Slope structure. Wells on the Møre Platform have proven both Triassic and Jurassic reservoirs in these half-grabens (Jongepier et al., 1996). On the inner part of the Møre Platform and the Måløy Slope, fault block crests were eroded to the basement level during the late Jurassic and Early Cretaceous (Figure 4). The redeposition of the erosional products are potential good reservoirs in the basins.

CRETACEOUS RESERVOIRS

Cretaceous submarine sand reservoirs are identified on the Måløy Slope, Møre Platform, and in the Slørebotn Subbasin (Figure 3). Locally, the Cretaceous unit is dominated by mud-rich, deep-water slope-to-basin-floor deposits interbedded with coarse-grained clastic sediments (Sømme et al., 2019). The unit has proven prospectivity with hydrocarbon discoveries in Lower Cretaceous (Albian-Aptian) and Upper Cretaceous (Turonian, and Campanian) sand reservoirs near the Måløy Slope and Møre Platform (Figures 4 and 5).

Sandstone units were identified in well 6204/11-1 in a thick Upper Cretaceous section, with debrites and slump deposits of Turonian and Coniacian age (Figures 5a, c). A time-equivalent good-quality sandstone section has been interpreted to be stacked submarine channel complexes in well 6204/10-1, 17 km to the southwest (Prélat et al., 2015; Figure 5c). Toward the Slørebotn Subbasin, the submarine channels eroded into the underlying strata in which sediments were transported further into the basin and deposited in

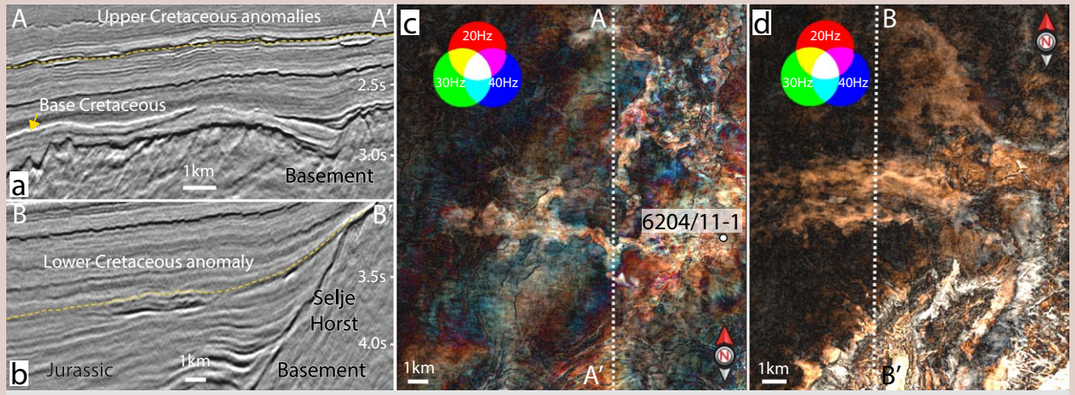

Figure 5: a) Seismic N-S section intersecting Upper Cretaceous anomalies in the Møre Platform. The yellow dashed line represents the base of the anomalies shown in (c), interpreted to be channels). b) Seismic N-S section intersecting lower Cretaceous anomalies in the Slørebotn Subbasin. The yellow dashed line represents a Lower Cretaceous surface shown in (d), interpreted to be channels with overbank deposits. c) RGB frequency blending from spectral decomposition analysis of the Upper Cretaceous (Kyrre Formation) sand. d) RGB frequency blending from spectral decomposition analysis of the Lower Cretaceous (Agat Formation) sand.

lobes. The north-south seismic sections and RGB frequency blending from spectral decomposition analysis show the confined channels and associated lobes (Figures 5a-d).

CENOZOIC RESERVOIRS

Various geologic details are revealed in the high-quality seismic dataset. Among these are proximal, thick basin-fill, polygonal faults, and an area with mounds and channels appear in the isochron of the Hordaland Group (Figure 6a). Above the polygonal fault systems, potential sand accumulations (residual sands, Utsira Formation) are observed as bright amplitudes (Figure 6b). The mounded structures can be interpreted to be the result of sinkites, where late Miocene-Pliocene sands have sunk into the polygonal faults, displacing highly porous diatomaceous ooze upwards (Rudjord and Huuse, 2024; Figures 6c, d). Bright-amplitude discordant reflections, interpreted as sand injections, are revealed in the Hordaland Group (Figure 6d).

REGIONAL 3D SEISMIC - A POWERFUL TOOL

The regional knowledge Viridien has gained in the North Sea through its NVG imaging and velocity model building work over the last decade has been applied to the new NVG24 dataset. Additional sparse OBN coverage acquired but not yet fully processed in the Slørebotn Subbasin and Møre Platform will also further enhance the velocity model used in the processing. Fast-track results from NVG24 are promising and already significantly better than existing public vintage data. The final data, processed with the latest seismic imaging technology, including advances in pre-processing, noise mitigation, and velocity model building, will benefit prospect evaluation in this area. The various prospective reservoirs described in the above sections demonstrate the variety of potential exploration models. With a high-quality modern seismic dataset, other play elements, such as trap and charge, can be evaluated and renewed exploration in this region can take place. Analog prospectivity extends further north and east, suggesting that acquisition should continue northward in this underexplored area of the Norwegian Continental Shelf. The potential to unlock the next giant hydrocarbon discovery may lie within the NVG24 or even further into the Norwegian Sea.

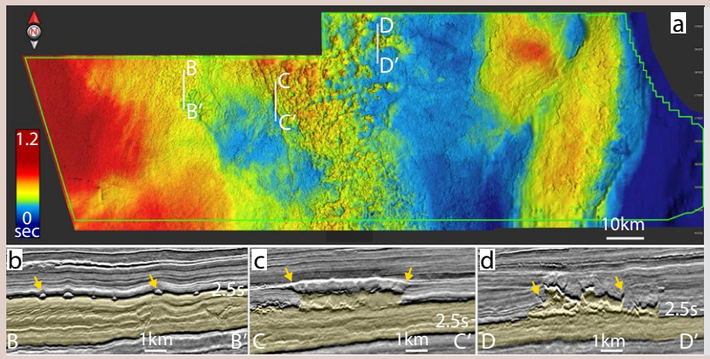

Figure 6: a) Isochron map of the Hordaland Group across the NVG24 area, revealing both subtle and significant thickness variations, as seen in seismic sections b-d. This map enhances differences across the survey area, as shown in the seismic sections. b) Polygonal-patterned ground in the west, with bright amplitude infill marked with yellow arrows in the figure. c) Mounded and elongated features occur in the central part. d) Discordant, bright amplitudes may represent sand injectites. These are found in the east and toward the Sogn Graben. Yellow colouring in the seismic sections indicates the thickness incorporated in the isochron map.