Petroleum Prospectivity and Basin Development of the Northeast Greenland-Jan Mayen-Norway Conjugate Margins Constrained by New Seismic Data and Seabed Samples

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The mid-Norway continental margin, the Jan Mayen micro-continent, the southwest Barents Sea and the northeast Greenland margin share a common geological history prior to breakup in the earliest Eocene. The NE Atlantic margins are highly prospective, and extensive exploration in the Norwegian and Barents seas since the early 1980's has resulted in the discovery and development of large oil and gas fields on the Halten and Dønna terraces, the deep water Ormen Lange gas field in the Møre Basin, and the Snøhvit and Goliat fields in the Barents Sea. In addition, several oil and gas discoveries have been made in the deep water Vøring and Møre basins where around 20 wells have been drilled. The petroleum potential on the conjugate northeast Greenland shelf is poorly known due to limited exploration activity. Since 2007, TGS has acquired more than 100,000 km of multi-client airborne magnetic and gravity surveys, 8,500 km of new seismic data, and reprocessed nearly 11,000 km of AWI seismic data. The data provide new insight into the crustal architecture and structure of the sedimentary basins offshore northeast Greenland. In addition, TGS/VBPR have collected seafloor samples from 12 sites on the Jan Mayen Ridge in 2011 and 140 sites offshore northeast Greenland in 2011 and 2012 as multi-client surveys. These samples add important stratigraphic information and constraints on potential petroleum systems in these frontier basins. The successful sampling surveys were the first to document active Jurassic hydrocarbon seeps and presence of Mesozoic sediments on the NE Greenland shelf and on the Jan Mayen Ridge. Whereas previous interpretation of stratigraphy and seismic sequences has been based on extrapolation of onshore geology and by analogy to seismic interpretations in the Vøring and southwest Barents Sea basins, the new stratigraphic samples provide tie to seismic data in areas where no exploration wells exist. Furthermore, geochemical analyses provide important constraints on regional seismic interpretation and basin modeling input.

The new data are important for understanding the petroleum systems across the conjugate margins. Structural interpretations and gravity and magnetic anomaly maps restored to breakup are used to delineate basins and highs across the conjugate margins prior to seafloor spreading. Data and knowledge from geology onshore northeast Greenland and offshore the mid-Norway margin may be used to assess the petroleum potential on the northeast Greenland shelf, however the results from integrated studies offshore northeast Greenland may be equally important in assessing the potential for petroleum traps beneath the flood basalts on the western Møre and Vøring basins and the hydrocarbon potential in the SW Barents Sea.