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Seismic petrophysics and forward seismic modelling for facies analysis within the Kobbe Formation, Goliat Field SW Barents Sea.

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The Goliat Field started production in March 2016, making it the first oil field to be in production in the Norwegian sector of the Barents Sea. The Kobbe Formation is volumetrically the most important in terms of the reserves. Quantitative seismic petrophysics will be important in delineating the cleanest reservoir intervals with preferential porosity preservation within the uplifted and strongly compartmentalised Kobbe Formation. This requires data integration from multiple sources and at different scales, involving geology, petrophysics, and geophysics.

A rock physics feasibility is first carried out to determine which petroelastic parameters best define the reservoir facies of interest. A suite of prestack inversion derived attributes is combined with EEI (Extended Elastic Impedance) volumes for subsequent facies classification. Calibrated rock physics models are then applied to the elastic parameters for shale volume estimation through inverse rock physics modelling. In addition, probability density functions (PDFs) are extracted from different petroelastic log combinations. The one with the best facies discrimination is applied to the inverted volumes and the facies probability results are compared with the shale volume predictions from the inverse rock physics modelling. Geobodies are then extracted using information from both classifications schemes.

Finally, forward seismic modelling using ray-based PSFs (Point Spread Functions) is performed using the inverted P-Impedance in areas where thick clean sand bodies are extracted. The forward modelling results using PSFs are compared with the output from a traditional 1-D convolution. A comparison is also made to the actual seismic data to assess resolution and illumination challenges for the target area. Such a combined forward and inverse seismic modelling approach helps to validate and constrain the geological interpretations made from the inverted data.