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# Utility and benefits of seismic attribute analysis in the description and interpretation of Paleogene sandstone intrusions and fluid migration in the Norwegian-Danish Basin

Katrine Juul Andresen (1), Ole Rønø Clausen (1), David Connolly (2), and Johan Byskov Svendsen (3)

(1) Aarhus University, Department of Geoscience, Aarhus C, Denmark, (2) dGB Earth Sciences, Houston, USA, (3) DONG Energy E&P, Hørsholm, Denmark

Seismic attribute analysis in the form of neural network trained gas chimney probabilities have shown to be of major importance in the description and interpretation of Paleogene sandstone intrusions in the Norwegian-Danish Basin. The Paleogene sandstone intrusions are recognized as two very different sets of remobilized sediments. The first set occurs on the hanging wall of a major normal fault and is typically recognized as elongated wing-like intrusions with a significant jack-up of the overlying successions. The second set occurs further north in an area highly influenced by salt structures and is typically characterized by remobilization with a very chaotic geometry and topography of the above jack-up succession. Both sets of intrusions are observed in Eocene host strata and furthermore occur in areas where aggressive Oligocene loading of the Norwegian-Danish Basin took place. A major challenge of this study is to explain the origin and formation of the two very different sets of intrusions and to unravel the primary processes for generation of overpressure, remobilization and trigger mechanism. Such processes potentially include deep and shallow fluid migration, depositional loading and fault- and salt related tectonics.

To get a better understanding of the fluid migration in the study area a gas chimney probability volume was calculated using the OpendTect software and neural network training. The chimney cube probabilities suggested a high probability of vertical fluid migration below the intrusions. This indicates that the formation of the intrusions probably is related to vertical fluid migration from the deeper successions through the upper Cretaceous Chalk Group and into the siliciclastic dominated Paleogene succession. Such deep fluid migration may have contributed significantly to the build-up of overpressure in the study area and should probably be considered as a major process for remobilization. Realizing the impact of deep fluid migration has a great influence on the explanation of the observed intrusions.

The study highlights that much new information can be gained by implementing seismic attributes such as neural network trained gas chimney probabilities in the analysis of geological structures potentially related to fluid migration