Turbidite Systems in the Northern North Sea: Applying Geological Process Modeling

Hoang Nguyen[1], Gildas Lageat[2], Caroline Fretheim[2], Nestor Cardozo[1], Lothar Schulte[3], Per Salomonsen[4], and Jan Tveiten[4]

[1]University of Stavanger

[2]Neptune Energy AS

[3]Schlumberger Information Solutions AS

[4]Schlumberger Norway Technology Center

ABSTRACT

Turbidite systems or submarine fans are considered to be the most important clastic accumulation in the deep marine environment. Due to the influence of both global and local factors on these deposits, the lack of outcrops, as well as the varying scale, there are mixed opinions on the assessment, classification, and modelling of turbidite reservoirs. Previously, sandbox experiments have been the most common method for turbidite modelling. However, this approach has some limitations. For instance, the scale of the model is miniaturized from the real system, and the execution is much shorter than the true geological time scale.

A relatively new and still underused approach, named geologic process modelling (GPM), or stratigraphic forward modelling (SFM), can help geologists to integrate the results of various disciplines into a consistent depositional model. This technique refers to a principle which quantifies and simulates the physical and biological processes, including sedimentation, compaction, and structural deformation, acting over geological time scales to reproduce the present-day geologic configuration.

With its properties, GPM is a sensible solution to solve existing problems in turbidite modelling. Based on physical laws, GPM retains the true behavior of a sandbox experiment. In addition, by applying numerical simulation, GPM does not have the time and space constraints of a physical laboratory. However, the required information is extensive, and as such only few, if any, cases have yet been published, describing an optimized workflow for setting up a model.

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This study analyses a turbidite reservoir in the Northern North Sea to understand the controlling factors and geological evolution of the turbidite system. The main objective is to validate the conceptual model and investigate the geometrical development and lithology architectures of the reservoir via the stratigraphic forward modelling approach.