Lateral and Vertical Facies Distribution and Associated Reservoir Properties in Glacial Depositional System, Tools for Better Reservoir Characterization

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Abstract

This study investigates glacial deposits with an objective to evaluate factors controlling the spatial quality of glacially related reservoir rocks with specific aim to generate a depositional model that accounts for the system complexity and helps provide better reservoir characterization. Subsurface cores from several wells were described, in addition to rock samples collected from different intervals. Samples were analyzed 1) under the microscope in thin section (including 300 point-count modal analysis), 2) by Environmental Scanning Electron Microscope (ESEM), and 3) by using bulk rock and clay X-ray Diffraction (XRD) tools to verify mineralogy, textures and therefore lithology units. The evaluation of reservoir rocks revealed a range of variabilities in rock quality of the studied interval. This variability is of two folds, 1) enhanced reservoir rock quality that is attributed to the dissolution of the detrital feldspar grains, and in some intervals to glacial structural deformation of rock fabrics and fracturing. 2) lower reservoir rock quality that is due to the existence of variable amount of cement types (e.g., silica, calcite, dolomite, anhydrite and clay cements), which is present in common, minor and rare quantities and different behavior across the section; in addition to inconsistent grain size, as well as moderate to high grain packing. Both variabilities consequently contribute to the variability of the enhanced and deteriorated reservoir rock quality. Glacial successions in the study area comprise a wide range of sandstone deposits, which create complex lateral and vertical facies properties. Utilizing core-based analysis depicts the reasons of reservoir quality variabilities, and it gives a way to understand the reservoir behavior through pointing out the reservoir enhanced and deteriorated areas and the controlling factors. Thus, this technique will enable field geologists and engineers to more precisely locate sweet spots and set better well development plans.