



Geomechanical Stratigraphy of the Late Ordovician Sarah Formation Glaciogenic Paleochannel Deposits: Reservoir Outcrop Analog from Central Saudi Arabia

Jarrah Ahmed, Osman Abdullatif, and Mustafa Hariri

KFUPM, Geosciences Departemt, Dhahran, Saudi Arabia

(g2012202480@kfupm.edu.sa)(osmanabd@kfupm.edu.sa)(mmhariri@kfupm.edu.sa)

The Late Ordovician witnessed the first glacial event of Sarah Formation in Saudi Arabia Regionally; stratigraphic equivalent strata are recorded in the Arabian Peninsula and North Africa. These glaciogenic deposits of Sarah Formation represent an important target for tight gas sandstone reservoir in the subsurface where several challenges faced their exploration and challenges. This study investigates the lithostratigraphic and geomechanical properties of Sarah Formation using outcrop equivalent strata in central Saudi Arabia. We integrated field lithofacies analysis, Gamma Ray measurements, and petrographic analysis and geomechanical tests. The geomechanical properties measured are point load strength, Schmidt hammer hardness, ultrasonic velocity, uniaxial compressive strength and the elastic moduli measurements. The lithofacies are composed of slumped mudstone and siltstone that interbedded with medium to coarse-grained sandstones and poorly sorted diamictites. The lithofacies strength values range from low strength to extremely low strength. The geomechanical properties plots revealed four cluster groups that showed different lithological, petrophysical and geomechanical property ranges. Moreover, the study revealed five main geomechanical units that directly related to the lithofacies of the glaciogenic paleochannel. The lithofacies intact rock material and rock mass properties both affected the geomechanical properties and behavior of the glaciogenic paleochannel. This outcrop analog study might help to understand and predict the relation between lithostratigraphic and geomechanical properties of Sarah Formation glaciogenic deposits in the subsurface. Furthermore, this analog study might help to refine subsurface conceptual models and also provide guides and leads for exploration and development of these tight sand reservoirs.