



The Application of Terrestrial LiDAR in High Resolution Stratigraphic Modeling of Khuff Carbonates, Central Saudi Arabia

Mutasim Osman and Osman Abdullatif

KFUPM, Earth Sciences, Dhahran, Saudi Arabia (g201105050@kfupm.edu.sa)

Light Detection And Ranging (LiDAR) is a new technique that has been used recently for the geological modeling. The outcrop analog studies have been utilized to overcome the limitation in the data and techniques that obtained from the subsurface and the seismic investigations. In this study we conducted a digital outcrop model for Upper Khartam Member of Khuff Formation in Central Saudi Arabia. This outcrop is equivalent to the gas producing upper khuff reservoir in the subsurface. This study integrates high resolution sedimentological and stratigraphic description and measurements at outcrop scale with terrestrial LiDAR data. This work explains all stages of LiDAR application from field data acquisition, processing, analysis and interpretation. Sedimentological and stratigraphical investigations were carried out in the outcrop and four stratigraphic sections were described and logged. Detailed laboratory analyses included thin section petrography, porosity and permeability measurements. The sedimentological and stratigraphic investigations revealed that the composite sequence of Upper Khartam Member comprises of 6 lithofacies associations. These lithofacies were deposited into the following environments: 1) ravinement marine transgression, 2) foreshoal, and 3) shoal complex. The high resolution stratigraphic analysis indicates that the Upper Khartam Member consists of three high frequency sequences (HFSs) those are from bottom to top HFS-1, HFS-2 and HFS-3. The digital modeling allows accurate sedimentological, structural and statistical measurements of lithofacies. The digital model was integrated with stratigraphical field data which allowed better visualization of vertical and lateral lithofacies continuity and architecture of the strata at outcrop scale. The integration of the results of this work with subsurface data might help to provide better understanding and prediction of Khuff reservoir quality in the subsurface.