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PS Supervised Automated Lidar Mapping of Permo-Triassic Carbonate Strata, Jebel Akhdar, Oman*

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Abstract

On a field scale, Permo-Triassic carbonate strata in the Middle East are strongly layered and correlatable over long distances (>10 km), comprising uniform stratigraphic thicknesses and similar facies associations. Nevertheless, within layers, sedimentologic and diagenetic heterogeneity is complex, creating significant lateral reservoir property variations. It has been recognized (beneficially) that in certain subsurface reservoirs, cementation, leaching, and dolomitization can be linked strongly to original sedimentary texture and fabric governing distinct pore types being classified as rock types.

To help delineate rock-type partitioning, digital outcrop modeling (DOM) techniques were used within layered Permo-Triassic carbonates of the Akhdar Group composed of the Permian Saiq and the Triassic Mahil Formations exposed on the Saiq Plateau in Oman. This outcrop provides an ideal opportunity to investigate the evolution of a carbonate depositional system equivalent to important reservoirs in the Arabian Platform, such as the Khuff Formation. Digital mapping tools used to gather quantitative reservoir analog data include terrestrial scanning lidar, real-time kinematic GPS (RTK GPS), and high-resolution (~1 m) satellite imagery.

Fault planes, stratigraphic surfaces, and digital stratigraphic sections were recorded in the field, allowing construction of the geologic framework of the DOM. A new method of supervised-automated feature extraction using lidar was developed and tested to identify

outcrop-based rock types on the basis of geometrically corrected surface reflectivity (laser intensity) and roughness (weathering). These parameters were used to classify outcrop-based rock types and subsequently populate the DOM. In our case, laser intensity can be used to discriminate fine- from coarse-crystalline dolostones correlative with mud versus grain-rich textures. These results can be used to reduce uncertainties in static reservoir models and to test dynamic behavior. In addition, the data and technology can also be used to establish a training dataset.