3D Modelling of (Upper Triassic) Continental Mixed Fluvial Systems Integrating Digital Outcrop Images with High-Resolution Sedimentology: High Atlas, Morocco

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The Upper Triassic Oukaimeden Sandstones Formation (F5) comprises continental red bed fluvial/aeolian sediments deposited within a series of Triassic rift basins in Central Morocco. The study area in the High Atlas offers extensive outcrops, in-excess of 200 m high and extending for many kilometres, in a series of narrow tectonic belts bounded by major Tertiary reverse faults with an ENE-WSW orientation. The formation is composed of upward-fining sandstones often containing trough cross-bedding and current and oscillation ripples within stacked lenticular shaped sand bodies interpreted to be channels. These bedforms often display erosional bases with conglomeratic lags containing rounded pebbles of quartz, chert and felsic volcanics. Interbedded more tabular shaped units with planar cross bedding are interpreted to be large fluvial bars. Varying amounts of interbedded siltstones and mudstones are also present, with some lamination and occasional bioturbation, interpreted to be overbank floodplain and shallow lacustrine deposits.

The application of high resolution 3D laser (LIDAR) and Differential Global Positioning System (DGPS) mapping to these outcrops, combined with collection of traditional sedimentological data (sedimentary facies logs, palaeocurrent information, gamma ray logs etc.), provides a detailed dataset from which several OEclose to deterministic, reservoir models have been produced. Thirty one separate LIDAR scan positions containing over a billion data points have been collected covering a total area 5 km long by 250 m high, along with a high resolution field dataset consisting of 12 sedimentary logs 3 composite gamma ray sections and analyses of the different geo-objects.

This study has developed new approaches and methodologies in order to integrate the different data into a 3D georeferenced framework from which geostatistical information on object geometries and facies distributions can be obtained to populate the final reservoir model. These outcrops are an important analogue for the TAGI formation (Triassic Argilo-Gréseux Inférieur) representing one of the most productive siliciclastic reservoirs in central Algeria, and offer an excellent location to develop generic reservoir models for continental deposition systems.