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Stratigraphic Architecture of the Triassic Basins in Algeria

R. Eschard°, A. Hamel*

° Institut Français du Pétrole
* Sonatrach

The Triassic reservoir is one of the most prolific plays in Algeria, with the giant Hassi R'Mel and El-Borma fields and more recent oil discoveries in the Berkine basin. The Triassic succession mostly corresponds to fluvial channel belts interfingering and alternating trough time with floodplain and sabbkha sediments. Such reservoirs are heterogeneous both at the basin and exploration scales and the prediction of the reservoir extension is still a challenge.

The sequence architecture of the Triassic succession has then been established at a regional scale, using outcrop data in Algeria and Tunisia, 125 wells with a very good core recovery and new dating based on palynological analysis. A new interpretation of the tectono - sedimentary evolution of the Triassic basins is then proposed. Eight depositional sequences were determined and correlated all across the area from the Hercynian unconformity to the Rhaetian transgression. The reconstruction of the facies architecture of these sequences was made possible with an extensive facies analysis on cores, calibrated to outcrop observations.

In Algeria, The Upper Triassic succession corresponds to a major transgressive regressive cycle. Triassic sedimentation started during Upper Ladinian times in the northern part of the Berkine basin. The continental series onlapped the Hercynian unconformity, which presented at that time a smooth morphology guiding the oldest Triassic fluvial systems.

During Carnian times, an extensional phase induced the formation of NE-SW normal faults, partly inherited from Panafrican lineaments. Uplifted areas formed two main sub-basins, the Berkine and the Oued Mya basins bounded. The El Biod - Hassi-Messaoud high separated the two sub-basins. The horst and graben structuration was associated to major thickness and facies variations across normal faults. Extension was also contemporaneous to widespread lava-flows which covered the Northern part of the Hassi-Messaoud high and the Hassi R'mel area. In the graben, sediment supply direction where both longitudinal, the Saharan craton being eroded, and lateral, the Hassi-Messaoud high also supplying sediments towards the graben axis. In the Berkine basin, sand-rich braided fluvial systems alternated through time with mud-rich floodplain and ephemeral lake sediments. The Oued-Mya basin was covered at the same time by wide sandy braided-plain and extensive sand-rich sand-flats. Five third order sequences then form the TAGI reservoir unit. The five sequences are organised in an overall backstepping trend inducing a major onlap on the graben margins.

Restricted marine carbonated sediments ("Trias Carbonaté" Formation) where then deposited in the graben axis, in relation with a major transgression coming from the Paleo-Tethys. The dolomites, which interfingered with sand flat facies southwards, corresponded to the Maximum Flooding Surface of the whole cycle. Sediment supply also decreased at that time in the basin.

During Norian times, local fault activity decreased, but a global thermal subsidence affected the whole province. Horsts were progressively onlapped and covered by alluvial sediments. A wide sabbkha, connected to the Paleo - Tethys, extended in the North of the Berkine basin (S4 salt unit). At the same time, in the southern part of the Berkine basin, a large coarse-grained braided delta (the TAGS unit) interfingered with the sabbkha evaporites. Alluvial plain sediments covered the Oued Mya area. Upper Triassic sedimentation ended with a regional transgressive event depositing a thin dolomite bed with a regional extension (the D2 bed). A salt basin then was developed during the Lower Jurassic.

The main questions which will be addressed during this review of the Triassic basins both concern their structural history replaced in a global context and the climatic and sedimentological factors which interacted during the Upper Triassic times. We will also describe and compare the type sequences and their facies architecture of the TAGI and TAGS reservoir units.