

## **Evaporite Facies: a Key to the Mid Mesozoic Sedimentary Stratigraphy of North Kuwait**

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A sequence stratigraphic frame built from 30 wells used 10,000 ft of core to interpret lithofacies & depositional systems. Authigenic evaporates in North Kuwait Mid Mesozoic are indicators of arid climate & sea level, & occur in three carbonate-evaporite facies.

1. Supratidal sabkha with near shore enterolithic anhydrite in a matrix of thin interbedded laminated carbonates & distal shore chicken wire fabric anhydrites;
2. Evaporite lagoons at or just above sea level, filled by dense beds of anhydrite with thin laminations & ghosts of vertical & inclined palmate gypsum, inter-bedded with carbonate layers after cyanobacterial mats.
3. Restricted shallow basin fill records drops in sea level with massive to bedded bodies of anhydrite with partings of dolomite, carbonate &/or shale interbedded with layers of massive halite.

The Mid Mesozoic of Kuwait overlies Lower Mesozoic clastic & evaporative Minjur Formation fill of the rifted Arabian Plate Tethyan margin. It is unconformably overlain by the transgressive 2,000 ft (610 m) Mid Mesozoic Marrat.

The lower Marrat characterized by dense anhydrites of evaporative lagoons, & thin, nodular sabkha anhydrites. The depositional profile evolved into platform & basin divided by a high-energy barrier, while the margin prograded into a deepening basin, later filled by debris flows & argillaceous limestone. Anhydrites collected in lagoons behind the barrier as the margin prograded, & lagoonal sediments were replaced by tidal flat & sabkha facies.

The argillaceous signal in the upper Lower Marrat continued into the upper Marrat with thin aggradational cycles of evaporites in shallow evaporative lagoons & adjacent sabkhas and became more open marine carbonate deepening into the shale-dominated Dhurma Formation. This argillaceous character & that of the Marrat comes from reactivated Hercynian structures of the Arabian Shield to the west & northwest. Though no unconformities were recognized they may be represented by condensed intervals.

Clay content decreased as the Sargelu Formation aggraded as a drowning platform into the starved isolated Najmah basin with its shallow marine margin. Sea level drops caused Gotnia Formation basinal anhydrite & halite precipitation.