Sedimentology, Sequence Stratigraphy, Palynology and Diagenetic Evaluation of the Triassic Jilh Formation. New Insights from Saudi Arabia

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Abstract

The Jilh Formation (late Anisian to Carnian) was deposited on the southwestern margin of the Neotethys Ocean recording the flooding of a broad shallow marine platform. The Jilh Fm. is dominated by restricted clastic-prone mudrocks and sabkha anhydrite with interbedded shallow marine dolomitized carbonates organized into four 3rd order sequences. Within the Lower Jilh Formation, deposits encompass tidal flat to low-energy inner ramp thrombolytic microbial deposits with local anhydrite nodules and fenestrae structures interbedded with ft-scale intraclast-rich floatstones with desiccation surfaces. Within the interbedded mudrocks, land-derived miospores (including common *Lunatisporites* spp. and other taeniate bisaccate pollen) and clastic material are common. During the Carnian, the higher sea level resulted in a change to tidal flat bioturbated and microbially induced mudstones, along with inner ramp subtidal peloidal sand banks and skeletal wackestones with benthic foraminifera within the Upper Jilh Formation. Terrestrially derived miospores are still common (assemblage including common *Camerosporites secatus, Conipollenites arabicus, Duplicisporites* spp., *Samaropollenites speciosus*). However, an increasing marine influence is also noted during the Carnian from the presence of marine palynomorphs such as acritarchs and prasinophytes (including acanthomorphic acritarchs, *Veryhachium* spp. and *Dictyotidium* spp.). The backstepping of the platform during the Carnian is marked by the progressive flooding of the tidal flats and the deposition of open marine facies culminating in a regional 2nd order maximum flooding surface. Petrographic and geochemical analyses show the development of fabric-replacive planar-s to planar-e dolomites associated with negative $\delta^{18}O$ values and positive $\delta^{13}C$ values. Those values, along with the regional context suggest precipitation of the dolomite on top of 3rd and 2nd order sequences from possible transgressive reflux syn- or post- deposition of the Jilh Formation, after an initial recrystallization of the deposits by meteoric inputs from the exposed Qatar Arch. Zoned dolomite rhombs lining macropores might be related to burial diagenesis and pore-filling anhydrite and calcite are locally common. The local presence of native sulfur replacing primary anhydrite nodules, along with the minor calcitization of the anhydrite also suggest the onset of thermochemical sulfate reduction during the burial history at possibly high temperature.