

## **Cenomanian and Turonian Shallow Water Carbonates from the Western Arabian Plate Margin (Jordan): Facies, Sequence- & Chemo-Stratigraphy**

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### **Abstract**

Cenomanian and Turonian carbonates on the Arabian Plate are of particular economic interest for the region (e.g., Mishrif, Natih and Sarvak formations). While these deposits have been studied intensively on the eastern side of the Arabian Plate, they have attracted less attention along the north-western margin. On the western plate margin in Jordan, the Upper Albian to Coniacian Ajlun Group was deposited on a passive continental margin of the Neo-Tethys Ocean and comprises, from base to top, the Naur, Fuheis, Hummar, Shueib, Wadi as Sir and Khureij formations. It is primarily composed of shallow-water carbonates, marls as well as siliciclastics and thin evaporites. The Ajlun Group covers large areas of Jordan's subsurface and outcrops in the western part of the country along the Dead Sea Transform, where almost complete sections of approximately 500 m thickness allow for detailed sedimentological and stratigraphic analysis from microfacies to the basin-scale. Here, the preliminary results of a detailed sequence stratigraphic study of the Ajlun Group are presented and compared to time equivalent deposits in Oman (Natih Formation), constrained by new biostratigraphic and chemostratigraphic controls. This allows for the comparison of the sedimentation patterns across the Arabian Plate between Jordan and Oman.

A regional N-S trending 200 km long transect has been constructed based on 10 outcrop sections. Field observations were supplemented by >200 thin sections, while chemostratigraphic ( $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  isotopes) trends were based on > 320 samples, identifying the Mid Cenomanian Event I and the Oceanic Anoxic Event 2. Biostratigraphic age control is derived from literature sources and is further constrained by new nanofossil data. The sedimentary lithofacies range from siliciclastic fluvial deposits to inner platform and open marine carbonate deposits. Vertically, the depositional system evolves from a carbonate dominated system, beginning with the Late Albian transgression and lasting until the end of the Early Cenomanian (Naur), after which the system switches to a marl-dominated sedimentation mode intercalated with prominent carbonate sequences (Fuheis, Hummar & Shueib) during the remaining Cenomanian to Early Turonian. Following a forced regression during the Mid Turonian, expressed as a region-wide deposition of siliciclastics and evaporites (Top Shueib), carbonate production is re-established and dominates for the remaining Turonian succession (Wadi as Sir and Khureij).

Regional-scale correlations show a thickening from the clastic dominated southern sections (>150 m) towards the carbonate and marl dominated northern sections (>500 m), with a relatively flat ramp-type architecture for most of the transect. Towards the north, significant thickness increase occurs, suggesting increased accommodation. Furthermore, the stratigraphic correlations of key carbonate marker beds have

been refined at the regional scale and new observations on the occurrence of east- & westward propagating clinoforms composed of rudist-debris facies within the Naur Formation were added, introducing a new scale of lateral facies heterogeneities in the Ajlun Group.

The main Cenomanian third order depositional sequences can be correlated between Jordan and Oman. A significant difference occurs, however, from the Late Cenomanian onwards, when uplift and erosion limited the deposition of Turonian strata in Oman, while sedimentation continued in Jordan.