
A detailed Jurassic sequence stratigraphic framework for the formation of dolomites along south-eastern Gotnia shelf margin

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The late Early to Upper Jurassic (Pliensbachien-Tithonian) Surmeh Formation was deposited on the south-eastern margin of the Gotnia Basin. A detailed sequence stratigraphic model was established by integrating outcrop, subsurface, and biostratigraphic data. In addition, petrographic and fluid inclusion data were used to better understand the dolomitization of these carbonates.

The late Early to Upper Jurassic of the southern Gotnia basin is composed of two second-order sequences (Neyriz Formation and Surmeh Formation). Smaller-scale composite sequences are composed of mudstones/wackestones which shallow upward into oolitic and oncolitic grainstones. Carbonate facies of the late highstand systems tracts of the second-order sequences, as well as the composite sequences, were preferentially cemented up by early diagenetic meteoric cements. Mudstones and wackestones facies associated with the transgressive and early highstand systems tract of the sequences were preferentially dolomitized during burial with coarse anhedral to euhedral crystals. During burial and early structuration hydrocarbons migrated into these dolomites. The abundance of petroleum inclusions at the outer rim of euhedral dolomite suggests that major hydrocarbon migration occurred during the later stages of dolomitization. Continuous dolomitization occurred during deeper burial and formed saddle dolomites. Dolomite inclusions range in temperature from 90-120°C. Toward the end of the dolomitization process parts of the meteoric cemented seals were locally breached. Small-scale fractures and faults might have provided the pathways and small localized dolomite bodies (20m x 20m) formed within the lower part of the top seal. In summary, dolomitization is preliminary controlled by permeability contrast of the different facies during burial and is stratigraphically linked to transgressive parts of the depositional sequences.
