Sudair and Jihl Margin: Development of the Slope and Basinal Deposits in Oman During the Early–Middle Triassic

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Sudair and Jihl Margin: Development of the Slope and Basinal Deposits in Oman During the Early-Middle Triassic

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SUMMARY

In Northeast Oman, outcrop equivalents of the Sudair Formation are present and described as Lower Mahil Member, around 250m thick. Its lower part is built mainly of shale, muddy dolomites, microbialite and oncoidal grainstones, whereas the upper part is mainly represented by grainstones. The stratigraphy is poorly constrained and then, mainly by chemostratigraphy. Here we present detailed sections from slope deposits in the Jabal Sumeini area (Wadi Maqam units) to distally tilted blocks (Ba'id), basinal carbonates (Wadi Wasit) and oceanic deep-water deposits (Buday'ah). We present here new result on the stratigraphy and the architecture of the Arabian Platform margin and its interpretation as a slope, oceanic plateau and basin succession, which provides new insights into the evolution of the coeval Sudair and Jihl platforms. It seems that the accumulation rate in the slope and basinal deposits depends on the carbonate export from the platform - high in Smithian and absent or very reduced in Spathian and Anisian time. This infers for the southeastern Arabian platform high carbonate productivity during the Smithian and very reduced during the Spathian and much of the Anisian.

An epeiric platform developed during the Permian that lasted until the Cretaceous, flooding the Arabian Peninsula along the passive margin of the Neo-Tethys Ocean. This platform is characterized by gradual lateral facies changes. The Lower Triassic Sudair Formation represents carbonate-evaporite-siliciclastic deposits and is widely known as top seal for the underlying Khuff reservoir (Pöppelreiter et al., 2011). In Northeast Oman, outcrop equivalents of the Sudair Formation are present and described as Lower Mahil Member, around 250m thick (=Middle Mahil Member of Pöppelreiter et al., 2011). Its lower part is built mainly of shale, muddy dolomites, microbialite and oncoidal grainstones, whereas the upper part is mainly represented by grainstones. The stratigraphy is poorly constrained and then, mainly by chemostratigraphy. About the first 10m are late Induan in age, followed by 80m of Smithian deposits (early Olenekian), the thickness of the Spathian (late Olenekian) dolomite and the boundary to the Anisian is still not well age constrained, but could be around the top of the Formation. The Spathian could be as well totally absent. To better understand the stratigraphy, architecture and sedimentological evolution of the Arabian Platform during the Early and Middle Triassic, we looked for successions of its margin in the Oman Mountains.

The early Middle to Late Permian opening and extension of the Neo-Tethys Ocean resulted in the formation of a basin (Hawasina) and an adjoining continental slope (Sumeini). These paleogeographic elements were connected with the adjacent Arabian Platform and together formed the southern continental passive margin of the Neo-Tethys (Richoz et al., 2014). Furthermore early-rifted blocks, structurally detached from the edge of the Arabian Shield, occurred as isolated platforms (Ba'id) along the continental slope and were later incorporated into the Hawasina Nappes. Here we present detailed sections from slope deposits in the Jabal Sumeini area (Wadi Maqam units) to distally tilted blocks (Ba'id), basinal carbonates (Wadi Wasit) and oceanic deep-water deposits (Buday'ah).

The Lower Olenekian (Middle-Upper Smithian) records on the slope and in the basin huge amount of carbonates with an unusual high sedimentation rate (around 900m thickness in Sumeini, i.e. more than 1m/Ky). The drowned Ba'id platform records hemipelagic sedimentation of unusually expanded thickness for this kind of settings. Sedimentation on the slope changes dramatically during the Upper Olenekian (Spathian) where the Smithian carbonates are replaced by shales around 70m thick. The top of the shales is disconformly overlain by chert and siliceous carbonate of Ladinian age. It is yet unknown whether the shales range up to the Anisian or if the latter is absent. During the lower Spathian, in the basin the sedimentation gets more shaly and the thickness is reduced drastically. There, much of the Anisian is proved to be either very reduced or even absent, with renewed sedimentation in the Late Anisian.

This new understanding of the stratigraphy as well as the architecture of the Arabian Platform margin and its interpretation as a slope, oceanic plateau and basin succession, provides new insights into the evolution of the coeval Sudair and Jihl platforms. In particular, it seems that the accumulation rate in the slope and basinal deposits depends on the carbonate export from the platform - high in Smithian and absent or very reduced in Spathian and Anisian time. This infers for the southeastern Arabian platform high carbonate productivity during the Smithian and very reduced (or almost no carbonate production?) during the Spathian and much of the Anisian. Reasons of this change in paradigm have still to be understood.

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