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Epicontinental- to deep marine environmental transitions in the Triassic rifted margin of the north Arabian plate, Israel

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The transition from the Arabian plate epicontinental margin toward the deeper marine depositional system of the Middle to Late Triassic is tracked using data from deep boreholes in northern Israel. Biotic, sedimentological and diagenetic components from borehole cuttings were used to construct a carbonate-evaporitic depositional facies model for the Triassic.

Three N-S trending subparallel facies strips were recognized, trending along a narrow belt less than 45 km wide but 300 km long. The proximal stable inland region is an extension of the epicontinental marginal marine facies during the Anisian. To the north and west lies the second strip, characterized by a subsiding platform. In this strip, sections are consistently much thicker than the proximal strip, more richly fossiliferous with open marine microfauna, and where evaporitic, tend to have more salina –like features than the sabkhas typical of the more eastern facies strip. Despite these differences, these two facies strips have many features in common. A short-lived tectonic phase in the Pelsonian is recognized in both strips and interpreted as rifting, taking place over no more than 3 Myr. Both strips react to sea level rise in the Ladinian by increased deposition of carbonates, and to salinity changes in the Carnian by establishment of evaporitic regimes. A second short-lived rifting phase in the Tuvalian took place over no more than 7 Myr. Northward thickening commenced in the Anisian and continued into the late Carnian, to values well above average for the Triassic of the Arabian margin. Norian termination of rifting and evaporite deposition was accompanied by reversal of the subsidence pattern, with greater uplift towards the north. This uplift is apparently associated with volcanic thermal doming, but also represents the first phase of extensive uplift known regionally at the base of the Jurassic.

The western-most strip is the more tectonically active coastal shelf-edge region, displaying a facies suite sharply contrasting with the more inland ones. Thin, very shallow marginal marine deposits with many exposure horizons occur in the Anisian, while in the Ladinian a significant hiatus is found. In the Early Carnian, northwards occur autochthonous high cyclicity lofer-type systems, with evidence of frequent exposure and no evaporites, but to the south, a thick conglomerate and breccia unit was deposited. In the Late Carnian-Norian, mixed carbonates and shales (46%-12%) pass northward into thick carbonates and volcanics (>1000 m). These changes in the shelf-margin strip indicate continued tectonic activity and subsidence in the latest Carnian – Norian, in contrast to the more proximate region, where subsidence ceased and incipient uplift is recognized.

The differing sedimentary systems from the coast towards the east are explained by differential vertical subsidence in a N-S-trending rift system. The more proximal strips are tied to the epicontinental system in the south and to the open sea in the north, with a marine connection also to the west. Basin-and-Range type topography formed by tensile tectonics may explain the broad features. However data from the intermediate strip suggests that trans-tensile movements with a significant lateral component may explain the thicker sediments, providing a new way of explaining divergent Triassic sedimentary pattern inland from the Levant margin.