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Transition from marine deep slope deposits to evaporitic facies of an isolated foreland basin: case study of the Sivas Basin (Turkey)

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The Sivas Basin, located in the central part of the Anatolian Plateau in Turkey, formed after the closure of the northern Neotethys from Paleocene to Pliocene times. It developed over an ophiolitic basement obducted from the north during the Late Cretaceous. During Paleocene to Eocene times, the onset of the Tauride compression led to the development of a foreland basin affected by north-directed thrusts. The associate general deepening of the basin favored the accumulation of a thick marine turbiditic succession in the foredeep area, followed by a fast shallowing of the basin and thick evaporitic sequence deposition during the late Eocene. We present here the detailed sedimentological architecture of this flysch to evaporite transition.

In the northern part of the basin, volcanoclastic turbidites gradually evolved into basinal to prodelta deposits regularly fed by siliciclastic material during flood events. Locally (to the NE), thick-channelized sandstones are attributed to the progradation of delta front distributary channels. The basin became increasingly sediment-starved and evolved toward azoic carbonates and shaly facies, interlayered with organic-rich shales before the first evaporitic deposits.

In the southern part of the basin, in the central foredeep, the basinal turbidites become increasingly gypsum-rich and record a massive mega-slump enclosing olistoliths of gypsum and of ophiolitic rocks. Such reworked evaporites were fed by the gravitational collapsing of shallow water evaporites that had previously precipitated in silled piggy-back basins along the southern fold-and-thrust-belt of the Sivas Basin. Tectonic activity that led to the dismantlement of such evaporites probably also contributed to the closure of the basin from the marine domain.

From the north to the south, subsequent deposits consist in about 70 meters of secondary massive to fine-grained gypsiferous beds interpreted as recording high to low density gypsum turbidites. Such facies were probably fed from shallow water evaporitic platforms developing contemporaneously along the borders of the halite-? and gypsum-saturated basin.

Finally, the reworked evaporites are sealed by a thick (> 100 m) chaotic and coarse crystalline gypsum mass, carrying folded rafts and boudins of carbonate and gypsum beds. Such unit is interpreted as a gypsiferous caprock resulting from the leaching of significant amount of halite deposits. Gypsum crystals are secondary and grew from the hydration of anhydrite grains left as a residual phase after the leaching of halite. The halite probably formed in a perennial shallow hypersaline basin fed in solute by marine seepages. This former halite sequence is interpreted to have triggered mini-basin salt tectonics during the Oligo-Miocene.

The described facies and proposed scenario of the Tuzhisar Formation in the central part of the Sivas Basin may find analogies with other Central Anatolian Basins (e.g. the Ulukisla Basin) or with other basin-wide salt accumulations in the world (e.g. in the Carpathian Foredeep).