THE TERTIARY EVOLUTION OF THE HIGH ZAGROS FORELAND BASINS

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The purpose of this project was a sequence stratigraphic analysis of the Tertiary sequences of the Zagros mountains, mainly in the Lurestan area, in order to characterize the geodynamic context and the main stages of the tectono-sedimentary evolution of this domain. The studied sections are located between Kermanshah and Shahrekord in different tectonic units from the Crush Zone in the North-East to the Zagros Folded Belt in the South. The stratigraphic successions and the sedimentary facies show major differences from one structural unit to another. Generally, these sections attest an overall SW-NE polarity from an external domain located in the Zagros Folded Belt and the internal domain in the Crush Zone. This polarity is especially marked by the location of three successive foredeep basins from the Paleocene to the Mio-Pliocene, and by the development of major stratigraphic hiatuses. Our preliminary results give rise to new hypothesis about the Tertiary Zagros basin evolution. These hypothesis are to be tested and improved by additional field work.

A schematic organisation of the basin based on stratigraphic data collected in all the studied sections is proposed on figure 1. This organisation reveals three main tectono-sedimentary cycles related to three main stages of the basin evolution. Each T.S. cycles corresponds to deepening – shallowing-up facies succession interpreted as controlled by successive flexuration and uplift processes (foredeep – foreland stages).

*The Late Cretaceous – Paleocene tectono-sedimentary cycle (TS1)* is represented by the Amiran Fm. It corresponds to a deep flexural basin that develops during Late Cretaceous – Paleocene times in the Zagros Folded Belt and High Zagros domain. This tectono-sedimentary cycle extends widely to the southeast (external zone) but is absent in the Crush Zone (internal zone) where the Lower Eocene sequence lies directly upon the radiolarite obducted complex or upon the Late Cretaceous formations.

The geometry and the paleogeography of this flexural basin is still little known. Similarly, the tectonic processes controlling the flexural deformation at this time are not clear. The obduction is classically assumed to take place during late Cretaceous times (during Gurpi sedimentation). However, the position of the “Amiran Flysch” at the front of the obducted units of the Crush Zone suggests a relationship between this flexural basin and the obduction phenomena, perhaps implying a final collision stage at least in the northern part of the Zagros (?).

*The Lower Eocene – Oligocene tectono-sedimentary cycle (TS2)* begins with the widespread continental Kashkan Fm. that lie on the Amiran Fm. in the external domain and on the obducted units or on the late Cretaceous Gurpi Fm. towards the Crush Zone. This unit is assumed to fossilize the last stage of the obducted nappes emplacement. A transgressive carbonate platform develops during Cuisian times, at least on the northern units. During Late Cuisian – Lutetian times, the drowning of this carbonate platform is interpreted as a result of a new flexural deformation. It leads to deep water carbonate sedimentation dominated by gravity flow processes of various amplitudes. During Late Oligocene, the hemipelagic / turbiditic sequence shows a shallowing up evolution and grades to a prograding carbonate platform that constitutes the top of the tectono-sedimentary cycle TS2. It is of a major interest to note that the Eocene – Oligocene (fore)deep basin identified between Borujerd and Kooran at the front of the MZT was probably localized in a more internal zone than the previous Paleocene foredeep since the obducted units of the Crush Zone are affected by the flexural deformation. It means that the front of the tectonic units loading the arabian plate at this time should have been rather far to the north, and at present time deeply buried under
the Sanandaj-Sirjan Zone. This consideration have important implications concerning the paleotectonic restorations, and particularly the amplitude of the Oligocene and Mio-Pliocene successive tectonic shortening, the width of the paleomargin and successive foreland basins, etc.

The Upper Oligocene – Pliocene tectono-sedimentary cycle (TS3) is marked by a renewal of the flexural subsidence that affects the whole studied domain from the Crush Zone to the Izeh zone in the Zagros Folded Belt. In the latter zone, this subsidence favours the vertical aggradation of the Asmari carbonate platform from Late Oligocene to Early Miocene times. In the Kermanshah Crush Zone, a carbonate platform of same age fossilizes the Eo-Oligocene deformation phase. The increasing subsidence results in the drowning of the platform and the development of a new turbiditic basin (“Miocene Flysch”). This turbiditic sequence is deformed by the latest main thrusting phase. In this area, the progressive deformation of the northeastern margin of the basin during Mio-Pliocene times is recorded by the interfingering of prograding fan-delta conglomerates in the marine marls. The high terrigeneous input combined with a strong flexural subsidence lead to the vertical aggradation of a thick massive conglomeratic sequence (Bakhtiari Fm.) attributed to Mio-Pliocene period. Multiple intraformational unconformities attest to the syntectonic character of this conglomeratic sedimentation.

Figure 1 - Preliminary hypotheses on the Zagros foreland basin evolution

Reference: