

Tectonic Control on Depositional Sequences in Foreland Basins: The South Pyrenean Basin Case Study

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The South Pyrenean foreland basin is an exceptional case to study the influence of regional tectonics in depositional sequences. The architecture and facies distribution of its distal carbonate margin and its relationship with the siliciclastic infill of the basin-trough allow deciphering lithospheric tectonic processes linked to basin evolution. On the other hand, chronology and kinematics of deformation in the basin can be traced through the study of growth structures. Regional lithospheric and upper-crustal tectonics interacted with global eustatic cycles to control local variations of sea level.

The main depositional sequences in foreland basins (related to foreland-basin backstepping) are overimposed to global sedimentary sequences by the influx of regional tectonics. These sequences in the South Pyrenean foreland basin can be viewed as the sedimentary consequence to successive deepening steps linked to forelandward migration of the basin trough. Each step started with a drowning phase, in which sedimentation could not balance subsidence; this was followed by a progressive increase in sedimentation rate in relation to subsidence rate. This evolution is reflected in the architecture of the foreland carbonate margin (backstepped) and in the siliciclastic basin fill especially when it evolves from underfilled to overfilled (Southeastern Pyrenees). The ages of the main drowning surfaces are ~55 my (base of SBZ 7), ~49,5 my (SBZ 12), ~43,8 my (base of SBZ 15) and ~41,2 my (top of SBZ 16). These steps can be correlated all along the basin and are useful to trace the basinal subsidence history. This sedimentary history dates the effect of episodic orogenic crustal thickening onto a previously thinned foreland lithosphere.

If we compare this deformation history with the kinematics of basin deformation inferred from growth structures, we do not find a good agreement. Growth structures show younger ages related to the lateral and forelandward progression of deformation in upper crustal levels and these ages do not represent sequential limits.