Textbook example of tectonically controlled carbonate sedimentation at the active margin of a rift basin: the Leza Fm (Early Cretaceous, Cameros Basin, Spain)

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Detailed geological mapping and analysis of lateral facies relationships, specifically regarding the carbonate Leza Fm, have revealed that sedimentation was strongly controlled by extensional tectonics on the active northern margin of the Cameros Basin during Barremian-Aptian times.

The Cameros Basin, the northernmost sedimentary basin of the Mesozoic Iberian Rift System, is an intraplate extensional-ramp rift basin formed from Tithonian to Albian. It recorded up to 6500 m of vertical thickness of mainly continental sediments and was inverted by contraction due to the Cenozoic Alpine compressive movements.

The Barremian-Aptian sedimentary record on the northern margin of the basin includes the clastic Jubera Fm (alluvial fans), the carbonate Leza Fm (coastal lakes) and the mixed clastic-carbonate Enciso Gr (fluvio-lacustrine). The first two units were deposited in a series of small and semi-connected fault-controlled depressions (2-8 km wide). Although the Cameros Basin has undergone compression since the inversion of the basin, the original extensional tectonic controls on sedimentation are revealed by detailed mapping of the units and of synsedimentary normal faults. These faults fractured the Jurassic substrate of the basin forming reliefs that were eroded, causing the deposition of the Jubera Fm alluvial fans. The faults continued to actively create accommodation space during deposition of the Leza Fm, which shows a gradual transition from the Jubera Fm towards carbonate coastal-lacustrine deposits. The synsedimentary faults do not appear to have significantly affected the overlying Enciso Gr. Thus, the Barremian-Aptian at the active margin of the basin shows an initial stage of localized tectonic subsidence followed by a period of more generalized subsidence.

The synsedimentary faults are observable at both map and outcrop scale, and can be classified into depression-bounding faults and intra-depression faults. The depression-bounding faults have hectometric displacements, are longer (~1 km) and generally have a different orientation than the intra-depression faults, which are shorter and have smaller displacements.

This extensional tectonic setting controlled the stratigraphic architecture of the Leza Fm, creating a complex system of interrelated sedimentary environments (including alluvial, fluvial, lacustrine, palustrine, evaporative and marginal marine) laterally switching from one to the other inside the relatively small area of each tectonic depression. Nevertheless, since the Leza Fm shows marine influence, eustatism must also be considered as another depositional control.

These features make the Leza Fm an outstanding example of the influence of extensional tectonics on carbonate sedimentation at the active margins of rift basins, where it is possible to study patterns at outcrop scale and to compare them with larger scale examples at the present-day and in the geological record.

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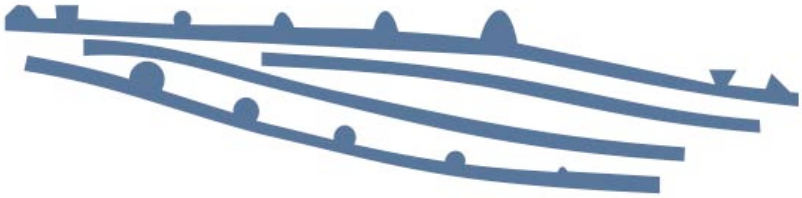

28th IAS Meeting of Sedimentology, 5—8 July 2011, Zaragoza, Spain

Abstracts

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