

Subsidence History of an Upper Carboniferous Foreland Basin

Birgit G. Dietrich*, Thilo Bechstädt and Rainer Zühlke
Geological-Paleontological Institute, University of Heidelberg
Heidelberg 69120, Germany
birgit.dietrich@urz.uni-heidelberg.de

ABSTRACT

The northern Spanish fold-and-thrust belt of the outer part of the European Variscides has a multi-phase deformation history. To carry out sedimentological analysis, 2-d structural balancing was applied along two parallel transects. Minimum shortening rates along the transects range from 20% to 54%, depending on the tectonic units within the transects.

The sedimentary pile of the Southern Cantabrian Basin comprises a succession from the Cambrian to the Carboniferous. Reverse basin modelling results include data for the initial rifting-to-drifting phase and the following passive continental margin stage, showing uniform low total subsidence rates with a maximum of 50 m/Ma (total subsidence rates include values for thermo-tectonic, flexurally and compaction induced subsidence).

This study concentrates on the syn-Variscan development during the Bashkirian and Moscovian (Upper Carboniferous). Aerial photographs, stratigraphic sections and thin section analysis along with biostratigraphic data were used for facies interpretation and lateral correlation of the carbonate platform of the Valdeteja Formation, its platform-to-basin transition and the subsequent diachronous mixed carbonate-siliciclastic deposits of the San Emiliano Formation.

The change in depositional environment from a shallow-water rimmed platform to a mixed carbonate-siliciclastic basinal deposition reflects the response of the lithosphere to the successively approaching Variscan Orogen. The depocenter migrated in front of the orogen from the west to the east. Platform termination proceeded from the west to the east, mainly influenced by relative sea-level rise and siliciclastic input from the orogen. Eustatic sea-level variations played a subordinate role. Due to the high flexural rigidity of the plate, low total subsidence rates of 315 m/Ma at maximum created little accommodation space during the orogenic foredeep stage. Thermo-tectonic subsidence rates of 205 m/Ma accounted for the main portion of the subsidence whereby compaction (60 m/Ma) and flexurally (50 m/Ma) induced subsidence rates constituted a small portion only.