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**Combination of Structural Balancing, Reverse Basin and Forward Stratigraphic Modeling: New Methods Applied to Old Rocks (Southern Cantabrian Mountains, Spain)**

The processed transect (24km) situated at the southern margin of the Cantabrian Mountains (NW-Spain) comprises the whole basin infill between top of basement (560Ma) and time of maximal burial (34Ma). This part of the Variscan orogen is represented by a foreland thrust and fold belt, further shortened during Alpidic orogenesis, offering magnificent outcrops in each individual thrust sheet. In order to carry out basin modelling at this tectonically affected region, a multidisciplinary approach of detailed field mapping, structural balancing and stratigraphic modelling is required.

Total tectonical shortening of the basin, derived from 2-D structural balancing of the deformed basin infill, amounted to 54% at minimum. 2-D reverse basin modelling investigated the quantitative development of the basin architecture and long-term evolution of accommodation space in time. Stratigraphic forward modelling quantified sedimentary processes (erosion and sedimentation rates), refined the sequence stratigraphic model, and offered geometrical minimum/maximum models of the sedimentary patterns.

Three major subsidence trends obtained from 2-D reverse basin modelling reflect different plate-tectonic development stages of the basin. Precambrian to Ordovician times recorded uniform tectonic subsidence rates (-11 to 19 m/Ma). Differential subsidence triggered by local tectonics (-28 to 66m/Ma) generates marked changes of depositional environments (Silurian until Late Devonian). Our study indicates major influence of total subsidence and sediment supply liable for the remarkable alternating siliciclastic and carbonate deposits during the Devonian. Eustatic sea-level fluctuations were only of subordinate importance. In the Upper Carboniferous, eastward migrating depocentres coupled with high rates of tectonic subsidence (-177 to 300 m/Ma) reflect movements of the Variscan front.