Geophysical Research Abstracts
Vol. 12, EGU2010-4547, 2010
EGU General Assembly 2010

Syn-tectonic carbonated sedimentation and gravitational collapses on the border of the Basque-Cantabrian Albian pull-apart basin.

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The Basque-Cantabrian Basin is an E-W trending, 200 km wide basin, mainly filled by Cretaceous deposits, located along the northern continental margin of Spain. The basin is linked to the lower Cretaceous rifting (from late Barremian to Early Albian) between iberian and european plates, that resulted in oceanic accretion in the Gulf of Biscay. This rifting occurred in a relatively homogeneous Jurassic carbonate platform. By reference to the european plate, the Iberian plate moved toward the SE with an anticlockwise rotation. This rotation generates an extensional motion in the Bay of Biscay and an important sinistral strike-slip motion in the Basque-Cantabrian basin and in the Pyrenees area.

In the Basque-Cantabrian Basin, strike-slip motion occurred on major NW-SE-trending faults and produced pull-apart sub-basins in which great thickness of Cretaceous sediments accumulated. During Albian, one of the main depocenter was located between the Bilbao fault and the Lekeitio fault. This depocenter was mainly filled by siliciclastic and/or calcareous turbidites whereas Urgonian carbonate platform and shallow marine sandstones deposited northward in the Biscay High, nowadays in the Gulf of Biscay offshore. On the southern border, a mixed ramp dipping toward the North was developed with Urgonian carbonate platform on paleo-high and shallow water siliciclastic deposits in sub-basins depocenters.

The study area is located north of Bilbao, mainly along the coast line from Plenzia to Bermeo, and corresponds to the Northern border of the Basque-Cantabrian basin. This part of the basin is filled by calcareous gravity-driven deposits coming from the North interbedded with an axial siliciclastic turbiditic system with a lateral feeding mainly from the West. These multi-entry points are typical for pull-apart basins and are consistent with the regional structural context. Detailed mapping and sedimentological analyses evidenced the very short distance (about 500m) from the Urgonian carbonate platform to the basin. The lateral transition of facies includes grainstones and floatstones in the Urgonian carbonate platform, and calcareous gravity-driven deposits (including grainstones with shallow-water skeletal debris and megabreccias with up to 5 m-wide Urgonian limestones blocks) interbedded with marls in the basin. Grainstones with shallow-water skeletal debris imply classical grain-flow resedimentation from the carbonate platform. Limestones blocks in megabreccias imply lithification prior to reworking and the size of the blocks suggest a tectonic control increasing the slope and inducing collapses. Therefore, these breccias can be interpreted as slope apron facies, linked to an important fault scarp affecting the Urgonian carbonate platform.

Structural analyses allow us to identify and study the fault scarp related to slope apron facies. The fault is striking NE-SW and is interpreted as the conjugated fault of the regional sinistral NW-SE-trending strike-slip faults. Both NW-SE- and NE-SW-trending faults are consistent with conjugated sinistral strike-slip motion with N-S extension and E-W shortening. Despite the strike-slip motion on regional faults, the apparent motion on the NE-SW fault is clearly extensional, as indicated by the dip-slip offset of the Urgonian carbonate platform. This NE-SW fault limits the platform development toward the South and localizes the slope apron facies.

This study emphasizes that the faults bounding a pull-apart basin rather exhibit extensional kinematic marked by uplift and subsidence, which determine the position of paleo-high and depocenters. These results highlight the

difficulty to find clear evidences of strike slip motion in pull-apart basins. Finally, we define a syn-deformation lateral facies distribution for carbonate-dominated margin in a pull-apart context.