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The Bakio salt wall and its effects on synkinematic deepwater sedimentation (Basque Pyrenees, Northern Spain)

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The Bakio diapir is an outcrop analog for deepwater plays in the Gulf of Mexico and other passive margins. It is among the kilometre-scale diapiric structures that developed in relation to the North Iberian extensional margin during the Early Cretaceous. It is cored by Triassic evaporites and flanked by synkinematic strata comprising Albian shelf and slope carbonates and Upper Albian to Cenomanian siliciclastics (Deva Fm.).

The outcrops in the area allow for a reasonable depiction of the 3D geometry of the diapir and its relationship with flanking deepwater strata. The dataset includes hundreds of stations where structural data were collected, measured stratigraphic sections, and a detailed geological map. The data were acquired by a combination of conventional field techniques and more innovative ones such as mapping on photorealistic digital terrain models, analysis of airborne LIDAR data, and multiview 3D reconstruction, which enabled structural data to be collected in non-accessible areas.

The structure is a SW-NE trending salt wall at least 3.5 km long, 0.8 km wide, and up to 1.2 km high. The flanking deepwater strata are up to about 1000 m thick and exhibit onlap and growth geometries characteristic of passive diapirism. They are made up of a lower carbonate unit and an upper siliciclastic unit bounded by a sharp contact. This unit change is thought to be related to processes operating on a regional basin scale. A comparison of both flanks reveals remarkable differences in terms of dominant facies and trends. In the SE, the carbonate unit is fining upwards and dominated by a limestone-breccia facies, while in the NW it exhibits an overall coarsening-upwards trend dominated by a fine-grained facies. The siliciclastic unit is coarsening upwards in the SE and fining upwards in the NW. It is coarser-grained and more erosional in the NW than in the SE, including erosional channels and abundant debrites in the NW and deposits from unconfined flows and shallow channels in the SE. The observed differences can be related to differences in kinematics between the flanks of the Bakio salt wall. These differences could be attributed to a combination of changes in the geometry of the salt-sediment interface, thickness of diapir roof, height and width of topographic relief over the diapir flanks, subsidence rate in adjacent minibasins, unhomogeneities in the salt body (e.g.: dolerite bodies within the salt) and differences in the subsalt structure. Current work is being oriented towards a 3D reconstruction of the structure and paleocurrent analysis.