Salt Tectonics and Salt-Sediment Interaction around the Bakio Diapir, Basque-Cantabrian Basin, Pyrenees

Eduard Roca[1], Mireia Butillé[1], Ferrer J. Oriol[1], Pau Arbués[1], Marco De Matteis[1], Josep Anton Muñoz[1], Mark Rowan[2], and Katherine Giles[3]

[1]University of Barcelona
[2]Rowan Consulting Inc.
[3]University of Texas at El Paso

Abstract

The Bakio Diapir is a partially exposed and partly submerged salt structure on the Basque coastline that is flanked by Cretaceous marls, debrites and deepwater turbidites. We use a dataset that comprises structural and stratigraphic outcrop data, airborne LlDAR, detailed bathymetry, 2D seismic data, and an exploratory well, to evaluate the subregional setting of the diapir and the associated salt-sediment interaction. The Bakio Diapir is a NNE-trending salt wall developed during the opening of the Bay of Biscay (latest Jurassic-Early Cretaceous) and subsequently reactivated during the Pyrenean orogeny (Santonian-middle Miocene). It initiated as a reactive diapir close to the northern margin of the rift basin at the intersection of a S-dipping extensional fault and an E-dipping transverse fault, and evolved into a passive diapir by the early Aptian at the latest. The Bakio Diapir and nearby Bermeo and Mungia diapirs have been displaced ~10-15 km to the north in the hanging wall of the northern frontal Pyrenean thrust system, which is detached on Upper Triassic evaporites that constitute the source of the diapiric salt, and are linked by a polygonal pattern of anticlines. The overburden consists of a ~500 m-thick Jurassic carbonate platform and a 2-3 km-thick succession of Aptian-lower Albian marls and carbonate breccias and upper Albian-Cenomanian siliciclastic turbidites. Adjacent to the diapir on both flanks, the strata form tapered composite halokinetic sequences with convergent bedding folded to vertical and overturned. The change from carbonate- to siliciclastic-dominated sedimentation is sharp and thought to be related to basin-scale processes. The carbonate breccias are concentrated at the northern end of the diapir and disappear southwards. They represent debrites sourced from extensive carbonate platforms along the northern rift margin and probably a local platform on the topographic high of the diapir that collapsed during diapiric drape folding. A major unconformity, slightly above the base of the turbidites, cuts out progressively older strata to the south, where it erodes into the diapir itself. Turbidites on the western flank are sand-rich proximal facies, sourced from the rift margin to the north that flowed to the southwest parallel to the diapiric high. In contrast, turbidites on the eastern flank are finer-grained distal facies that flowed to the northwest from an unknown source to the southeast and were deflected to the west by the diapir.