Basin Evolution and Tectonics of the Northern Alboran Sea During the Plio-Quaternary (Western Mediterranean)

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The West Alboran Basin (WAB) was surveyed by ConocoPhillips in 2000 and 2001, which performed a regularly-spaced grid of 2D seismics, seabed coring, and a complete multibeam-swath bathymetry mosaic. In conjunction with other data from different scientific cruises carried out in the area, it is confirmed the existence of a broad field of fluid venting structures in the basin floor, like mud volcanoes and pockmarks. These features appear in relation to major shale diapirs in the WAB, being developed either from their flanks or at their culminations.

The most-recent evolution of the northern margin of the WAB has been studied using the multichannel seismic dataset of ConocoPhillips, completed with commercial and scientific seismics. Seismic interpretation has been tied with boreholes at the Spanish shelf, in particular with ODP-Leg 161 data (Site 976). We have distinguished four major, seismostratigraphic units in the Plio-Quaternary series of the WAB. These units are bounded by regional discontinuities which have been mapped through, thus completing a pseudo-3D seismic model (~1650 km^2) for the post-Messinian sediments (<5 Ma).

The inferred sedimentation rates for this period reflect a strong sedimentary input from the Spanish margin (>0.3 mm/y) with lower sedimentation rates at the deeper portions of the basin and at the top of shale diapirs (<0.2 mm/y). The ascent of shale diapirirs and their collapse (developing symmetrical grabens) condition the broad geometry of the seismic units, although important global sea-level fluctuations during the early Pliocene and early Quaternary seem to determine the formation of major turbidite systems. Turbidite canyon courses, sedimentation rates, and the internal geometry of the sedimentary units are in summary clearly controlled in the WAB by deep-seated processes, mainly by the shale diapirism.