Detailed analysis of the interaction between alongslope and downslope sedimentary processes in the Alboran Sea during the Pliocene and Quaternary

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Abstract

This work aims to analyze the interaction between alongslope contouritic and downslope gravitational processes in the Alboran Sea. Recent results (Juan et al., 2012, 2016) demonstrated that the Pliocene and Quaternary stratigraphic architecture is mostly made up the vertical stacking of contourites interrupted by turbidite systems (TSs). The accurate analysis of all available seismic profiles has revealed several morpho-sedimentary signatures produced by the interaction of the Atlantic Water (AW) and Mediterranean waters (MWs) with the gravity flows in the Pliocene and Quaternary sedimentary record, as well as on the present-day seafloor. Different levels of interaction have been identified and they move between two-end-members: from bottom currents dominating gravity flows, to gravity flows dominating bottom currents. In between these extreme cases, a range of possibilities can occur. First, downslope and alongslope processes can alternate, with vertical and cyclic stacking of both types of deposit. Second, these processes can be balanced, allowing the simultaneous outbuilding of contourites and gravity flow deposits. Last, bottom currents can influence gravity flows. This last interaction is the most common in the Alboran Sea, resulting in the migration of the fan deposits in the direction of the dominant current, and also with effects on the architecture of the turbidite fans, and on their sedimentary composition (grain size). The different levels of interaction change in space and time. These changes have controlled the different depositional architecture displayed by the Spanish and Moroccan margins and the lateral changes along the Spanish margin as a consequence of the different architecture of the turbidite systems. Although interaction occurs in both margins, it is especially complex and varied on the Spanish margin, where the alongslope action is related to the AW, the light intermediate and the dense deep Mediterranean waters (LMw and DMw, respectively). This complex interaction has resulted in a depositional architecture that changes laterally as a consequence of the different architecture of the turbidite systems. Contrasting, on the Moroccan margin the alonsglope action is dominant, being mainly governed by the energy of the AW and the WMDW, that primarily inhibits the formation of canyons and related fan lobe deposits. This inhibition has been interpreted to be result of the topographical acceleration of the WMDW core that would favour an intense alongslope sediment transport, preventing deposition, avoiding the convergence of sediment, and thus inhibiting the formation of downslope gravity flows.