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The Gulf of Cadiz: Example of an Unstable Giant Contouritic Levee

The Gulf of Cadiz represents the pathway of a strong, warm (13°C) and saline (> 37 g.l⁻¹) bottom current called the Mediterranean Outflow Water (MOW). This flow comes out of the Mediterranean and spreads in the mid-depth North Atlantic at water depths of 500-1500 m. Its velocity is > 3 m.s⁻¹ when it flows out of the Strait of Gibraltar and decreases downstream for reaching a few cm.s⁻¹ seaward of the Cape St. Vincent (southwest Portugal). The MOW is at origin of the gravelly material found near Gibraltar and construction of many silty to clayey contouritic drift distally.

New high-resolution bathymetry and imagery data were collected during the CADISAR cruise on the RV Le Suroît (August 2001) using a multibeam echosounder EM300. Downstream of the Strait, the MOW can be either channelled by major or secondary channels, or spill over a sedimentary levee. The high-sedimentation rate associated with the frequent earthquakes and the constant shearing by the water current generate overspread sediment deformation and instability. At the mouth of secondary channels, sediment accumulates as small sandy lobes. Depositional and erosional features show the major influence of the seafloor morphology on the MOW dynamics. These observations suggest that the Gulf of Cadiz system shares many similarities with channel-levee complexes formed by turbidity current activity. The main difference is that in the Gulf of Cadix, the main process is a contour current interacting locally with gravity processes occurring in channels and valleys dissecting the continental slope.