



Crustal structure and active tectonics in the Gulf of Cadiz from MCS images

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The Gulf of Cadiz is a geologically complex area with several evolutionary, structural and chronological open questions. It is part of the Gibraltar Arc System, whose limits in the gulf area are inferred but not verified. It also hosts the east edge of the Eurasia-Africa plate boundary, which is diffuse in this zone and mainly represented by strike-slip faults covered by the big sedimentary wedge that occupies great part of the gulf area masking these structures in depth. In this work we use modern multichannel seismic data acquired in the gulf area in order to answer some of these questions to constraint the great-scale crustal structure and to define some of the tectonic structures currently active.

Seismic images show that the imbricated wedge is bounded between the Gulf of Cadiz margin at the north, the Kenitra margin at the south and the Rharb margin at the east. It's mainly structured by imbricated thrust sheets similar to an accretionary prism. Its maximum thickness (~10 km) is in the eastern zone of the gulf and it gradually thins toward the west. It is covered by sedimentary sequences whose oldest unit is uppermost Tortonian. In abyssal depths, it is buried by sediments of the Seine Abyssal Plain and it pinches out some ~500 m west from what seems to be the deformation front in bathymetry. No imbrication thrusts are affecting the seafloor at the foot of the imbricated wedge indicating that it is not currently growing and, therefore, that this is not an active subduction thrust. It is probably inactive since ~5-6 Ma.

Toward the east, MCS profiles image high-amplitude continent-verging reflections corresponding to pervasive normal faulting, related to an extended terrain, named here Rharb margin. It seems to act as the backstop of the imbricated wedge and it is over-thrusted by Prebetic/Flysh sequences off the Strait of Gibraltar.

A NS trending MCS image show normal faulting off the Iberian margin related with continental thinning. Contourite deposits are well imaged in this northern margin, as well as the imbricated buried wedge and the sedimentary abyssal deposits toward the south. Wide-angle data along this MCS line shows well coincidence in geometry and velocities with these sedimentary packages. Good coincidence is also observed in reflections related to the basement and particularly to what corresponds to a piece of oceanic crust, between the continental margin of Iberia and the oceanic transitional crust of the Seine Abyssal Plain. In the Kenitra margin, the seismic images show normal faulting probably related with an extended continental crust or a continent-ocean transition crust. The age of this extension is probably Triassic-Jurassic, and we propose it as the conjugated margin of the Gulf of Cadiz.

The current deformation is focused in: 1) large-scale NW-SE strike-slip faulting, crossing from the Horseshoe Plain to Rharb margin, and 2) minor thrusting and folding in the inner part of the wedge. This deformation is not related with sedimentary wedge growing but with Iberian and African plate convergence.