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Update of the tectonic map of the Gulf of Cadiz area

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The area of the Gulf of Cadiz is tectonically complex due to the superposition of different tectonic structures throughout its geodynamic evolution since middle Jurassic times, with the oceanic spreading of the Central Atlantic and the opening of the fracture zone between Iberia and Africa, to the NW-SE convergence of Africa and Iberia in present times. Currently, this convergence (3.8-5.6 mm/yr.) produces a diffuse deformation of plate boundary that has been related to strike-slip faults (swim lineaments) that cross the area with a WWN-SSE direction. This faults as well as other tectonic structures are largely covered by the great sedimentary body of the Gulf of Cadiz that prevent a clear bathymetric visualization and depth-imaging of these structures.
In this work we focus on verifying the presence in depth of tectonics structures defined in the scientific literature of the Golf of Cadiz and the Guadalquivir Basin, in order to obtain an update tectonic map of this region. For this, we first select representative scientific articles on tectonics of the area and selected tectonic maps. We georeferenced these maps and digitized tectonic structures (normal, reverse, strike-slip faults and lineaments) to create a compilation of the main faults mapped in the area. Then, we made a compilation of seismic data that included multichannel seismic (MCS) profiles from public and private databases, European projects and the seismic data acquired by our group. We used our new MCS database to confirm the existence in depth of the tectonic structures identified before and gathered in the compilation. We finally generate a new tectonic map of the area that includes the verified structures, differentiating their type and activity.
In the new map we present and redefine two main structures of the Gulf of Cadiz and the Guadalquivir Basin which are: 1) the thrusting front of the Guadalquivir Allochthonous Unit and 2) the Mountainous Front. Both of them are thrust faults systems created during the Betics Orogeny and are inactive since their formation and emplacement some 6-7 Ma.
On land, in the Guadalquivir Basin, a group of lineaments of tens to hundreds of kilometers long were not verified in the MCS profiles and thus not included in the final map. Similarly, intra-basement fault systems with thrust structures verging to the SE in the Algarve Basin, were not verified and discarded.
Current active faulting is related to normal faults identified in the platform and the upper slope of the margin in front of the Cadiz Bay. These faults, resulting from the emplacement and movement of mud diapirs, are abundant but relatively short (5-10 km long) and shallow (<2 km below the subsoil). Larger active faults are identified in the deepest parts of the gulf area, for instance, thrust faults like San Lorenzo and Horseshoe faults, and the SWIM strike-slip faults.