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Seismotectonics of the Gulf o Cadiz based on the NEAREST OBS experiment: mechanisms and faults

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One of the main purposes of the NEAREST project (Integrated observation from NEAR shore sourcES of Tsunamis: towards an early warning system GOCE, contract n. 037110) was the identification and characterization of seismogenic and tsunamigenic structures in Gulf of Cadiz area, source region of the Lisbon 1755 earthquake and tsunami. To address this problem 24 broadband Ocean Bottom Seismometers (OBS) and a seafloor multi-parametric station GEOSTAR (Geophysical and Oceanographic Station for Abyssal Research) acquired between September 2007 and July 2008 passive seismic data in this region. The results delivered a detailed investigation of the local seismicity, revealing 3 main clusters of earthquakes, two of them coinciding with the location of the 3 larger instrumental earthquakes in the area: i) the 28th February 1969 (Mw$\sim$8.0); ii) the 12th February 2007 (Mw=6.0) and iii) the 17th December 2009 (Mw=5.5). Most of the recorded events are located in the mantle (at depths between 30 and 60 km). However, focal mechanisms show a mixed pattern, mostly strike-slip and reverse dip-slip with a very few normal mechanisms.
This implies the existence of tectonically active structures located much deeper than the ones mapped by Multichannel seismic reflection. A thorough analysis shows that the seismicity clusters are offset with respect to the upper crustal active thrusts. The wide-range solutions of focal mechanisms also imply that the related source processes are complex. It can reflect the interaction of different active geological structures and local rheological contrasts. To understand these new results in the context of the seismotectonics of the Gulf of Cadiz a review of some available geophysical data (reflection and refraction seismic profiles interpretation) in this area is presented. The results obtained in this work improves our knowledge about the local seismicity and related actives faults in the Gulf of Cadiz area, giving a new contribution to access to the seismic hazard in this critical region.