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Characterization of the seismicity in the Gulf of Cadiz based on eleven month monitoring by the NEAREST OBS network

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The Gulf of Cadiz offshore SW Iberia is an area that is prone to the generation of destructive earthquakes and tsunamis, like the famous 1st November 1755 Lisbon event. A considerable effort from many international teams allowed the recognition of the main active geological structures that may generate large earthquakes. However, the relationship between the frequent small magnitude events and the geological structures have been elusive so far due mostly to the unfavourable geometry of the seismic network based on land stations that does not allow a precise hypocentre location.

To address this problem the EC project NEAREST (Integrated observation from NEAR shore sourcES of Tsunamis: towards an early warning system) conducted a passive seismic experiment in the Gulf of Cadiz where 24 BB seismometers (plus the GEOSTAR multi-parameter deep-sea observatory) were deployed for 11 months, between the summer 2007 and summer 2008. The careful examination of the continuous data stream allowed the detection of a large number of local events that were not detected by the land networks of Portugal, Spain or Morocco. The analysis of the complete data set reveals 3 main clusters of earthquakes that coincide 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 (ML=6.0). Many of the small magnitude earthquakes are located in the mantle (depth between 30 and 60 km), like the hypocenters of these three earthquakes derived from waveform inversion. However, not a single structure is active in each cluster area since focal mechanisms show a mixed pattern, mostly strike-slip and reverse dip-slip with a very few normal mechanisms.