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Sub-crustal earthquakes beneath the Gulf of Cadiz - First results from seismological observations with the NEAREST OBS network

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The geophysical and geological investigations conducted so far in the Gulf of Cadiz allow us today to have an idea of the largest active faults that can generate destructive earthquakes and tsunamis comparable to the Nov 1st, 1755 Lisbon event. However, their kinematics and seismic activity are poorly known because the seismic networks based on land do not allow a precise hypocenter location and estimation of focal mechanisms for the smaller events. Therefore the EC project NEAREST (Integrated observation from NEAR shore sourcES of Tsunamis: towards an early warning system) was initiated (GOCE, contract n. 037110).
One of the main objectives of the project is the characterisation of the tsunamigenic sources in the Gulf of Cadiz through seismological monitoring of natural seismicity by means of 24 BB seismometers deployed for 11 months in addition to the GEOSTAR multi-parameter deep-sea observatory. Together with the dense onshore seismic networks the temporary OBS network will allow the location and characterization of small seismic events more precisely than it can be done with onshore stations only. Spectrograms are used to identify previously unknown earthquakes. One of the major questions is the maximum depth of seismic activity beneath the Gulf of Cadiz. In the recording period from September 2007 to August 2008 about 300 events were located within the OBS network using the Portuguese onshore seismic stations. Magnitudes range from 1 to 4.7 (ML from Institute of Meteorology Lisbon, Portugal). Using the OBS network many events could be detected which are not located by the onshore stations. First results show that the events occur to approximately 50 km depth, often deeper than the locations by land stations, and confirming the results available from regional and teleseismic waveform modelling. Focal mechanisms show strike-slip and thrust-slip events.