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Seismic activity in the gulf of Cadiz inferred from OBS data

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The offshore Cadiz basin is located in the Eurasian-African plate boundary, west of the Gibraltar strait, in a region of diffuse deformation where plate convergence is accommodated along a complex network of faults. This region is known for its ability to unleash earthquakes of large magnitude, such as the February 28, 1969 ($M_S \approx 7.9$) or the great Lisbon earthquake of November 1, 1755 ($M_w \approx 8.7$), which affected all the south and southwest coast of Portugal, causing a high number of casualties.

With the aim of better understanding faults that are currently active in the region, and which could generate large earthquakes similar to those occurred in the past, a temporary network of 24 Ocean Bottom Seismometers (OBSs) was deployed offshore south Portugal from January to July 2010, within the scope of the TOPO-MED project.

We use this data to study seismic activity in the region. The OBS data provide a good coverage of the offshore region, and in addition we use data acquired by several land stations, both from temporary and permanent networks in south Portugal, southwest Spain and northwest Morocco.

We detect, locate, and determine the magnitude of abundant low-magnitude tectonic earthquakes in the region. Additionally, we further detect and locate other non-conventional seismic signals which are coherently recorded across the network. For event detection and location, we take advantage of a fully automated new algorithm, which screens the continuous seismic dataset and which does not require phase picking. A preliminary analysis of only 10% of the data allowed us to detect about 100 non-conventional seismic signals and about 200 earthquakes. For the same period the land-based catalog reported only 96 earthquakes.

Our results will be compared with previously published earthquake maps, geologically mapped faults, and other geotectonic features such as mud volcanoes.