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Seismicity of a slow deforming environment: Alentejo, south Portugal

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Mainland Portugal lays on a stable continental region characterized by slow tectonic rates. However, the region has been the source of moderate to large magnitude earthquakes in historical times. Remarkable seismic activity has also been recorded in the instrumental period. A clearly asymmetric distribution of earthquakes between north and south is observed. The Alentejo region (south Portugal) presents belts of high epicenter density and delimits a transition between a nearly aseismic zone, to the northeast, and an area with significant seismic activity to the south. Earthquake clusters are located within an area where the relation between small earthquakes (ML<4), tectonics and lithospheric rheology is not obvious.

A high resolution image of the Alentejo region seismicity is presented. The dataset was recorded by a dense seismic network of 17 seismometers operating during 14 months (June 2011 - September 2012). The data was processed using new automated earthquake detection and location procedures. About 600 earthquakes were detected. High-precision relative earthquake locations were obtain by means of waveform cross- correlation and double difference algorithms. Besides fine-tuning earthquake locations, the relocated catalog was used to analyse the spatio-temporal properties of earthquake clusters.

In the absence of earthquake catalogues representative of the whole seismic cycle, the study of small earthquakes (ML<4) coupled with field geology and satellite data are shown to be useful tools to characterise active lithospheric processes in slow deforming regions.