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Investigating active faults in SE Iberia: borehole and surface seismic monitoring

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Monitoring seismic signal associated to active faults in SE Iberia was undertaken by the installation of 3-component geophone strings in boreholes and also on the surface, close to active faults located in Torreperogil-Sabiote area and Baza basin. Our instrumentation was installed in existing hydrogeological and geotechnical boreholes for continuous monitoring of low intensity seismic activity during 8 months. Borehole geophone strings consisting of 8 receivers of 3-component, with 15Hz of natural frequency, spaced 6 m at depth were used.

The main purpose of continuous monitoring of the seismic signal in the subsurface was to record the high frequencies of the seismic data and to investigate and eventually characterize fault creep and seismic noise related to deformation and fault movements in seismically active areas. The dataset recorded included a series of low magnitude earthquakes and is being analyzed to identify and characterize seismic events.

A 3G GSM module was used together with the acquisition system in order to guarantee remote access to check the acquired data quality and to control the acquisition parameters. Also, the remote access allowed us to pre-process the data 'in situ' and to perform only selective transmission of the most relevant files. Because of the isolated and remote locations of some of the monitoring stations, proprietary software was developed to avoid the possible losses of communication between the acquisition system and remote control computer.

In this contribution we present the most relevant features of the acquisition and methodology implemented for this acquisition, first results of the field experiment and data processing and advantages of the on site pre-processing management and remote operation of the acquisition system. This system is being applied to other active fault zones in the area.