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Fine fault structure of the 2012-2013 earthquake swarm in the eastern Guadalquivir basin (South Spain)

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Seismic swarms in areas with low seismic activity offer valuable information on the stress regimen from often-unidentified tectonic structures. From October 20^{th} 2012 to end of October 2013, a seismic swarm with more than 6500 located earthquakes took place near the village of Torreperogil in the Eastern Guadalquivir basin. We relocate 523 events (m_d >1.5) using the double difference algorithm, in order to image the active structures associated with this swarm. Relocation places most events at 4-6.5 km depth along to two separate, steep dipping, ∼N-S trending lineaments at ∼1 km distance, with the western lineament becoming active more than 2 months after the start of the swarm. The Hough algorithm indicates a direction of N173E for the main alignment, similar to the result from full waveform moment tensor inversion for the large earthquake, yielding a strike slip mechanism with NS striking left-lateral plane. The results draw a scenario of ∼N-S left-lateral blind faults in a highly fractured volume of the Variscan basement underlying the basin, consistent with a ∼NNW direction of the principal compressive stress in the central Betics. The strike slip faulting style is compatible with an inactive mountain front in this sector, but the simultaneous activity of these side-by-side faults is not straightforward to understand in terms of stress transfer. We found no evidence for triggering of this sequence, investigating as possible mechanisms the pore pressure variations by hydraulic diffusion from rainwater, variations in elastic loading following the fluctuations in the water table of aquifers, as well as triggering by large remote earthquakes.