Paleo-surface ruptures at both sides of a pressure ridge along Alhama de Murcia Fault (SE Spain)

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The Alhama de Murcia Fault (AMF) is one of the most seismically active faults in the Iberian Peninsula, with important associated historical and instrumental seismicity (e.g. the 1674 EMS VIII and 2011 Mw 5.1 Lorca earthquakes), and numerous geomorphic and paleoseismic evidence of paleoearthquakes. It is an oblique left-lateral strike slip fault within the Eastern Betics Shear Zone (EBSZ), a nearly 500 km long fault system that absorbs a great part of convergence between the Nubian and Eurasian plates. Previous paleoseismic studies have mainly focused on the southwestern and especially the central segment of the fault and yielded slip rate values ranging from 1.0 up to 1.7 mm/yr. In the central segment (Lorca-Totana), the fault splays into several branches, the two frontal ones forming a pressure ridge. Paleoseismic trenches have exclusively been dug in the northwestern fault of the pressure ridge, where most of the displacement is along strike, while the expected reverse southeastern branch has never been directly observed.

We present the first results of paleoseismic trenching across a complete transect of the pressure ridge in the Lorca-Totana segment of AMF. To do so we excavated an exceptionally large trench (7 m deep) in the NW branch and 5 trenches in the SE branch. We have been able to: a) extend the paleoearthquake catalogue in the NW branch by interpreting a total of 13 paleoearthquakes, 6 of which were not identified in previous studies. A restoration analysis has been performed; b) unveil the existence and recent activity (Holocene) of the thrust that bounds the pressure ridge to the SE. We have interpreted at least 5 surface ruptures, with the last one being younger than 8-9 kyr BP, based on new radiocarbon dates.

The study of these two sites allows for the refinement of the seismic parameters of the fault, formerly inferred from the study of a single branch. In this sense, the more complete paleoearthquake catalogue will allow for reassessment of the recurrence intervals assigned to the fault and new slip rate estimates will be inferred by combining data from the two studied sites. Furthermore, forthcoming OSL dates may allow us to prove or reject the synchronicity of surface ruptures on both sides of the pressure ridge, shedding light on the rupturing style of this fault.
system during the Late Quaternary. We discuss how these new data on fault-interaction may affect several seismic parameters and their repercussion in source modelling for fault-based probabilistic seismic hazard assessments (PSHA) of the region.