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Searching for Earthquake Sources in the Lower Tagus Valley (Portugal): First Results

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The area of Lisbon (Portugal) has been struck by destructive earthquakes in the past and with very intense consequences. As of today, two main areas host active faults with concern for the region: offshore with the still unclear source of the famous and catastrophic 1755 earthquake and inland with the Lower Tagus Valley where unidentified fault(s) have produced the 1909 and 1531 events with estimated magnitudes ranging from 6 to 7. Those latter events are of particular importance due to their location within an area that is now densely populated. The repetition of such a shock today would have a barely imaginable impact on the population and economy of Portugal.
An apparent paradox is that in spite of the high stake and expected impact on the Greater Lisbon area, little is known about the source fault(s) of the 1531 and 1909 earthquakes in terms of location, dimensions, maximum magnitude, slip rate and recurrence period.
By combining detailed geomorphological mapping using high-resolution digital elevation models with shallow geophysical imaging (reflection seismics, electrical tomography and ground-penetrating radar), we identify the continuation of crustal faults close to the surface. Several fault traces are outlined by uplifted terraces and offset streams and visible in satellite images and the national 10-m-resolution digital elevation model. These faults may be up to 100 km long and capable of producing M7 earthquakes.