



Evidences of Paleoearthquakes in Palaeolithic settlements within fluvial sequences of the Tagus Basin (Madrid, Central Spain).

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Multiple evidences of soft-sediment to brittle deformation within the Pleistocene fluvial terraces of the Tagus, Jarama, Tajuña and Manzanares river valleys have been described since the middle 20th Century. Cryoturbation, hydroplastic deformations due to underlying karstic collapses or halokinesis on the substratum of neogene gypsums, and seismic shaking have been proposed to interpret these structures. These deformations are typically concentrated in the +18-20 m terrace levels, and closely linked to well-known Palaeolithic sites, in some cases overlaying and/or affecting true prehistoric settlements (i.e. Arganda, Arriaga and Tafesa sites) within the Jarama and Manzanares valleys. The affected settlements typically display acheulian lithic industry linked to the scavenging of large Pleistocene mammals (i.e. *Elephas antiquus*). Commonly, deformational structures are concentrated in relatively thin horizons (10-50 cm thick) bracketed by undeformed fluvial sands and gravels. The soft-sediment deformations usually consist on medium to fine sized sands injected and protruded in overlaying flood-plain clayey silts, showing a wide variety of convolutes, injections, sand-dikes, dish and pillar structures, mud volcanoes, faults and folds, some times it is possible to undertake their 3D geometrical analysis due to the exceptional conservation of the structures (Tafesa). Recent geo-archaeological prospecting on the for the Palaeolithic Site of Arriaga (South Madrid City) conducted during the year 2009, let to find out an exceptional horizon of deformation of about 1.20 m thick. It consisted on highly disturbed and pervasively liquefacted sands, which hardly can be attributed to no-seismic processes. The acheulian lithic industry of the Madrid Region have been classically attributed the Late Middle Pleistocene (< 350 kyr BP), but recent OSL dating indicate that the basal horizons of the +18-20 m fluvial terraces hold ages younger than c.a. 120-100 kyr BP in this zone. All the evidences point to the occurrence of concentrated seismic activity during the OIS 5 (Last Interglacial) interfering early human activity in the zone. Presently, the Tagus Basin is subject to moderate seismic activity with strongest seismic events not exceeding intensity VI MSK (1954 AD), but most of them related to the Jarama, Tajuña and Tagus river valleys, which are bounded by large linear escarpments carved in Miocene gypsums. These escarpments display a wide variety of brittle and ductile deformations, as well as clear geomorphological indicators of late Quaternary tectonic activity. Considering the recent ESI-2007 Scale, the reported structures indicate the occurrence of larger paleoearthquakes during the Middle-Late Pleistocene of at least local intensity VIII.

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