New soft-sediment deformation structure in the Miocene of Ouarsenis (Algeria), paleoseismic evidence

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The active Algerian zone margin is affected by numerous earthquakes due to the convergence of two tectonic plates. The Ouarsenis is structurally related to the external Tellian domain. This domain includes large pellicular structural sheets with mainly Miocene marl and/or sandstone sedimentary material and Cretaceous-Paleogene limestones which have been thrusted hundred kilometers southwards. Sedimentologically, the outcrops of the Miocene are "*terra incongnito*". Sediments of alluvial and coastal transgression to the deep marine deposits of Ouarsenis have undergone seismic activity during the Miocene based on the recognition of seismites in the sedimentary infills. From a morphological point of view, various types of earthquake-induced soft-sediment deformation structures (SSDS) formed as a result of plastic deformation, liquefaction and/or fluidization have been found in the study area. They include (1) load structures of sagging, load-casts and drop structures, which would have formed in a sediment with an inverse density gradient, ball-and-pillow and flame structures, (2) pillow structures dominating specific beds, (3) slump folds, (4) boudinage structures, (5) syn-deformational faults, and (6) sedimentary dikes and veins, (7) fluid-escape structures, contorted structures, and other structures. These structures have been interpreted as the result of liquefaction and fluidization processes induced by earthquakes, of magnitude larger than 5, being the minimum value for producing such processes, according to Ambraseys (1988).

Among these figures we have described a new thixotropic structure generating a parallelepiped geometry, from 20 to 30 cm long and 10 to 15 cm width, well structured and not distorted by the slope. The center is sometimes in swelling, limited by the same lithological nature (Figure 1). A deformation that can be described as seismites (Seilacher, 1984), is henceforth called "thixotropic polygon-like", TPL. It is interpreted as seismite, after which it would have been considered and eliminated any other possibility of genetic mechanisms that are specific to the sedimentary environment. This new deformation structure is never mentioned in bibliographic references. This deformation figure bears strong resemblance to "polygonal soils" (Figure 2), which are typical formations of the glacial and periglacial regions that are found on flat-to subhorizontal spaces and related to the segregation of materials under the effect of freeze and thaw action (cryoturbation effect). In contrast, the modelling of the TPL figures in question are observed on a slope of the bathyal zone, and could be maintained by a simple after-shocks of seismic events. The environment is identified by sedimentological evidence and traces of organic activities (ichnofacies).

Keywords : Marl, Miocene, Seismite, Comparison, Seismic shocks, Ouarsenis

Figure 1: new deformation structure, called "thixotropic polygon-like". Figure 2: "polygonal soils" of periglacial origin.

References

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