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OFFSHORE TSUNAMI DEPOSITS OR TSUNAMITES

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Tsunamites with the highest potential to be preserved in the geological record are those found in the offshore realm. Yet those are among the poorest known and studied.

The K/T boundary tsunamites around the Gulf of Mexico, triggered by the Chicxulub impact are the best known, but remain controversial because no recent analogs have been studied. The main criteria to distinguish those tsunamites from e.g. common turbidites, are the repetitive, graded, high-energy sublayers within a single clastic sedimentary unit that stands out among fine-grained offshore sediments. Often opposing current directions are found within the tsunamite. The sedimentary structures found within the tsunamite differ from those of the Bouma units in a turbidite, although some structures are found in both types. Typical in an offshore tsunamite are e.g. thick climbing-ripple intervals, pervasive parallel bedded units, some sole-markings. Gravity flow and traction currents prevail, and oscillating ripple-structures indicative of wave-movements are never encountered. Recently, late Miocene tsunamite occurrences in the Lago Mare were found in Spain and Italy. In the cliffs of Monte Conero near Ancona, three tsunamite units were found in the San Donato fm. These consist of several very coarse-grained, cross-bedded and graded units amalgamated in each other, embedded in fine-grained offshore mudstones with thin distal turbidites. The dominant structures are coarse upper flow-regime mega-crossbeds, indicative of traction-currents. The layers were earlier (Roveri et al 2005) interpreted as “fluvial flood density currents”, on the basis of an underlying paleosol. However, the paleosol

is easier explained as earthquake fissuring of the seafloor, because these fissures are filled with coarse-grained material from the overlying tsunamite. In the Feos formation in the Nijar basin, south Spain, tens of couplets or triplets of graded clastic layers are intercalated in fine-grained offshore deposits. The deposition of these layers is related to seismic activity along the nearby Serrata fault, because underlying fissures are filled with the coarse material from the basal layer of the couplets/triplets. Although a single layer can be triggered by an earthquake, repeated layers are better explained by individual tsunami surges.

The sediment transport in tsunamites is dominated by traction currents. Therefore it does not resemble the oscillation water movements of stormwaves leading to HCS (Hummocky Cross Stratification), but rather (micro)-tidal water movements lasting a few hours.