

Benchmarks, sediment source and hydrodynamics of the 1755 Lisbon tsunami deposit at Boca do Rio Estuary

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Abstract

Standardizing the signature of tsunami deposits has been pointed as a major limitation on the identification of paleo-tsunami deposits. This limitation majorly arises from the strongly source-dependent nature of these deposits, which in turn determines their composition and structure, and from the effect of the local morphology of the corresponding depositional environment. Here, we provide new high-resolution mineralogical, geochemical and paleontological data of the 1755 tsunami layer of Boca do Rio estuary (Algarve, Portugal) with the aim of unraveling the signatures of estuarine tsunami deposit and link them to sediment source. Our results show that the tsunami deposit is featured by an enhancement in Sr and Ca linked to the input of biogenic and detrital carbonates from the beach foreshore and a strong depletion in most terrestrial- and marine-sensitive indicators. The latter is interpreted to result from the reworking of the estuarine clays and subsequent dilution within a huge volume of sand eroded from the coastal barrier. It confirms that in the case of estuarine beach embayment, the sediment source is essentially proximal and coastal. Distinct textural and mineralogical features between the base and the top of the tsunami layer suggest the imprint of run-up and backwash currents derived from a unique wave. These findings provide a solid database for identifying tsunami deposits and can serve as a model for others tsunami investigations in estuarine beach embayments.

Keywords: tsunami deposit, estuary, geochemical proxies, mineralogy, hydrodynamics.

Pest-OE/CTE/LA0019/2011-IDL, PTDC/CTE_GIX/110205/2010