Title: Boulder deposition during major tsunami events

Author(s): Costa, Pedro J. M.\textsuperscript{1}; Andrade, Cesar\textsuperscript{1}; Freitas, Maria C.\textsuperscript{1}; Oliveira, Maria A.\textsuperscript{1}; da Silva, Carlos M.\textsuperscript{1}; Omira, Rachid\textsuperscript{2}; Taborda, Rui\textsuperscript{3}; \textbf{Baptista, Maria A.}\textsuperscript{4}; Dawson, Alastair G.\textsuperscript{5}

Source: Earth Surface Processes and Landforms

Volume: 36 Issue: 15 Pages: 2054-2068 DOI: 10.1002/esp.2228 Published: Dec 2011

Document Type: Article

Language: English

Abstract: A remarkable accumulation of marine boulders located above the present spring tide level has occurred in two coastal lowlands of the Algarve (Portugal). The size-interval of the particles studied here is seldom reported in the literature in association with extreme events of coastal inundation, thus making this study of relevance to many other coasts worldwide. The spreads of boulders extend several hundred meters inland and well beyond the present landward limit of storm activity. The marine origin of the boulders is demonstrated by well-developed macro-bioerosion sculpturing and in situ skeletal remains of endolithic shallow marine bivalves. The good state preservation of the fossils within the boulders indicates that abrasion during transport and redeposition was not significant. We envisage boulder deposition as having taken place during the Lisbon tsunami of ad 1755 through the simultaneous landward entrainment of coarse particles from nearshore followed by rapid shoreward suspended-dominated transport and non-graded redeposition that excluded significant sorting by weight or boulder dimensions. We use numerical hydrodynamic modeling of tsunami (and storm) waves to test the observational data on boulder dimensions (density, size, distribution) on the most likely processes of sediment deposition. This work demonstrates the effectiveness of the study of boulder deposits in tsunami reconstruction. Copyright (C) 2011 John Wiley & Sons, Ltd.

Author Keywords: Boulders; Storm; Tsunami; Sediment Transport; Bioerosion; ad 1755; Portugal

KeyWords Plus: High-Energy Events; Southwestern Spain; Sedimentary Record; Lisbon Earthquake; Extreme Waves; Ionian Coast; Portugal; Storm; Transport; Algarve

Reprint Address: Costa, PJM (reprint author), Univ Lisbon, Ctr Geol Univ Lisboa, Dept Geol, Fac Ciências, Edifício C6-3 Piso, P-1749016 Lisbon, Portugal.

Addresses:
1. Univ Lisbon, Ctr Geol Univ Lisboa, Dept Geol, Fac Ciências, P-1749016 Lisbon, Portugal
2. Univ Lisbon, IDL, P-1749016 Lisbon, Portugal
3. Univ Lisbon, LATTEX IDL, Dept Geol, Fac Ciências, P-1749016 Lisbon, Portugal
4. Inst Super Engn Lisboa, ISEL, Lisbon, Portugal
5. Univ Aberdeen, Sch Geosci Geog & Environm, Aberdeen, Scotland

E-mail Address: ppcosta@fc.ul.pt

Funding:
Funding Agency | Grant Number
--- | ---
Portuguese FCT | PTDC/CTE-GEX/65948/2006
European Project NEAREST

**Publisher:** Wiley-Blackwell  
**Publisher Address:** Commerce Place, 350 Main ST, Malden 02148, MA USA  
**ISSN:** 0197-9337

**Citation:** COSTA, Pedro J. M.; ANDRADE, Cesar; FREITAS, Maria C; OLIVEIRAI, Maria A.; da SILVA, Carlos M.; OMIRA, Rachid; TABORDA, Rui; BAPTISTA, Maria A.; DAWSON, Alastair G. Boulder deposition during major tsunami events. *Earth Surface Processes and Landforms*. ISSN 0197-9337. Vol. 36, n.º 15 (2011) p. 2054-2068.