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## Uncharted archives – imprints of tsunami backwash deposits on the Algarve shelf (Portugal)

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Research on offshore tsunami deposits is scarce and their depositional processes and preservation potential are virtually unexplored. Therefore, the RV Meteor cruise M152 mapped and sampled one coast-parallel and two coast-perpendicular transects at water depths from 65 to 114 m off the Algarve coast (Portugal). This coast was strongly affected by the well-known Lisbon earthquake and tsunami of November 1<sup>st</sup>, 1755 AD. Numerous onshore locations have been well documented and studied with historic damage reports and modern scientific investigations of the onshore tsunami deposits. However, very scarce information about the backwash, the water masses flowing back into the sea, exists and their imprint on the shelf is unexplored.

In order to fill this gap, a total of 19 vibracores were recovered during the RV Meteor cruise M152. For tracing the sedimentary imprint of the AD 1755 tsunami and potential predecessors, a multi-proxy analysis was carried out (sedimentology, micropaleontology, inorganic and organic geochemistry, radiocarbon and OSL dating). Within the offshore Holocene stratigraphic record, at least two event layers of likely tsunami backwash origin were identified based on their significantly different properties compared to the background shelf sediments. The uppermost tsunami layer (at a depth of 16-25 cm in most cores) displays an erosional contact at the base with heterogeneous compositional changes; its bounding radiocarbon ages allow a correlation with the AD 1755 Lisbon tsunami. Organic-geochemical markers, such as n-alkanes, polycyclic aromatic hydrocarbons, steroids and fatty acids, show an increased input of terrestrial matter in this offshore AD 1755 event layer.

A surprising discovery was another distinct high-energy deposit, i.e. a potential predecessor to the AD 1755 Lisbon tsunami, at a core depth of about 122-155 cm, which was <sup>14</sup>C-dated to approx. 3700 yrs cal BP. Due to its erosional base and coarse-grained composition (well-sorted medium sand), as well as the increased terrestrial influence (displayed by biomarkers), it can be assumed that this deposit originates from the backwash of a paleo-tsunami.

This multi-proxy approach with sedimentological, micropaleontological, inorganic and organic-geochemical criteria, enabled us to (1) identify of backwash tsunami deposits; (2) establish a recurrence interval; and (3) estimate the hazard potential for the related coastal areas. Results of the M152 cruise demonstrate for the first time that the depositional basins on the Algarve shelf have the potential to reliably archive Holocene tsunami backwash deposits. The low-energy environment of the outer Algarve shelf sets prime conditions for the preservation of tsunami backwash deposits. Thus, these geoarchives offer the possibility to study the mechanisms and hydrodynamics of backwash currents, and to investigate tsunami strata that are not preserved elsewhere.