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Sedimentological features of tsunami and storm deposits in Almargem (central Algarve)

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Recent work on the central Algarve (south Portugal) has revealed a complex coastal stratigraphic sequence on the Almargem lowland.
This sector of the coast is characterized by strong coastline recession, previous studies suggesting that it has retreated over 200 meters over the last 3 centuries.
A group of six trenches, making two N-S cross shore profiles, were excavated with 25 m distance between them in the lowland. The trenches were app. 5 m long, 2 m wide and 1.5 m deep.
The aim was to identify signature of extreme wave events in the sedimentary infill, using a multidisciplinary analytical approach, including lithostratigraphic descriptions, x-rays imaging, digital photography grain-size, magnetic susceptibility and morphoscopic analysis of sediment. OSL samples were collected and are being processed to establish a chronological framework.
Macroscopic analysis revealed that the topmost section of the Holocene sediments is marked by the presence of one macroscopically massive peculiar bioclastic medium sand layer, app. 10 cm below the present-day surface, which decreases in thickness inland and wedges out on the landward-most trenches. By opposition, the seaward-most trench presented multiple heavy mineral laminae at lower depths, likely resulting from successive washovers by storm events. In all trenches the basal section consists of greenish silt that increases in thickness inland.
This setting (presence of multiple storm deposits and one likely tsunami event in a receding coastline) makes this a challenging study site. In terms of tsunami deposition, the site preserves to the extreme, most inland depositional imprint of a tsunami event. Despite its massive character, the multidisciplinary approach followed herein allowed to clearly identify and differentiate three inundation phases within the tsunami layer probably associated to the 1755 tsunami event. Inundation phases were established based in variations of magnetic minerals, bioclastic composition and grain-size variations. Results seem to match historical records of the AD 1755 that commonly refer to 3 major waves having affected the coast of the Algarve.
The opportunity to establish trends of storm frequency or magnitude is also challenging, in particular within this coastal setting. Within a receding coast, the record is biased to the more recent storm events. Nevertheless, besides the peculiar tsunami layer, ongoing OSL work will allow to narrow the time-window of observation and will provide a unique and chronologically controlled record of storm events affecting this coastal sector, allowing future discussions on storm impacts during the last couple of millennia in the Portuguese south coast.
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