EGU2020-7542
https://doi.org/10.5194/egusphere-egu2020-7542
EGU General Assembly 2020

Unraveling the AD 1755 Lisbon tsunami through 2DV modelling

Ivana Bosnic[1] and Pedro Costa[2]
[1]University of Lisbon, Institute Dom Luiz, Lisbon, Portugal (ibosnic@fc.ul.pt)
[2]Department of Earth Sciences, University of Coimbra, Coimbra, Portugal (ppcosta@dct.uc.pt)

Understanding past tsunami events is key to assess tsunami hazard and numerical modelling is a powerful tool to better understand these events. A rising number of studies focusing on palaeotsunami numerical modelling reinforce the potential of this tool to unravel unknown features of past tsunami events. The AD 1755 Lisbon is the largest historical tsunami registered on Western Europe and despite its relevance there are still uncertainties regarding its source, magnitude and wave characteristics.

This work contributes to a better understanding of the AD 1755 tsunami through the evaluation of the wave characteristics and of the onshore and offshore sedimentary dynamic using Delft3D software (Flow module).

The study site, Almargem lowland, is located on the Portuguese southern coast (central Algarve) where a two-dimensional vertical (2DV) morphodynamic modelling approach was carried out along 10 vertical layers. Bathymetry is represented by a across-shelf profile with 7 kilometers long thus, extending from the coast up to 50 m deep. Bottom sediments and roughness vary along the profile according to the sediment characteristics of each coastal sector (shelf, beach, dune and lowland area). Boundary conditions were imposed according to three scenarios represented by offshore sinusoidal tsunami waves of 3, 4- and 5-meters height. Tsunami-induced sedimentary dynamics results show that the 3 m wave scenario (50 m depth) present the most compatible scenario with the observed onshore deposit, in particular its 600 m inland extension. Moreover, the dune was singled-out as the main sediment source of the deposit. This source-to-sink relationship confirms previous field and sedimentary results (Costa et al., 2012, Sed Geol).

A 3D morphodynamic modelling approach carried out by Dourado et al. (in press) on an adjacent study area (Salgados, central Algarve) also pointed to a 3-meter tsunami wave height (at 50 meters deep) and further corroborates the results of this work. Despite good initial results, with harmonization and validation of modelling results, further efforts are necessary to incorporate backwash influence on the onshore sediment dynamics as well as a detailed analysis on the vertical sediment distribution.

The authors would like to acknowledge the financial support from FCT through projects UIDB/50019/2020 – IDL and PTDC/CTA-GEO/28941/2017 - OnOff.