

TSUNAMI PROPAGATION ALONG TAGGUS ESTUARY – LISBON, PORTUGAL – PRELIMINARY RESULTS

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ABSTRACT

Large tsunami events are quite well described in Portuguese historical reports. The city of Lisbon, one of the main harbors in Europe, during the XVII and XVIII centuries was severely damaged by two tsunami events generated by strong magnitude earthquakes: 1531.01.26 and 1755.11.01.

Although the location of the source area of both tsunamis may be quite different, the effects along Tagus estuary are well known and described in coeval sources.

Tsunami propagation inside estuaries and coastal bays is a subject of major importance for tsunami risk evaluation. Strong non linear effects are present and focusing, reflection and amplification of the waves may occur in different points of the estuary. The effects of a tsunami event similar to the one that occurred in 1755 are not yet understood, due to the dense occupation along Tagus banks. Also the comparison with the 1755 impact, along the estuary, can not be extrapolated directly due to the heavy changes in the morphology and depth inside the estuary. The concrete buildings located along the banks should act as energy absorbers. In this study, we present the preliminary results of flood calculations. SWAN model (Mader 1988,2001) was used to model tsunami propagation, in the open ocean, from the source area towards the entrance of Tagus river. During propagation, in open ocean the bathymetric grid resolution was 2km and the time step used in calculations was 5 seconds. The seismic source was computed with Mansinha and Smiley (1971) equations for elastic half space homogenous approach. These results were used as input for the flood model used, TSUN2 Imamura (1997). This step used a very detailed bathymetric grid of 50 m resolution and a time step of 1 second. Both models need calibration; for that we use instrumental data from the 1969.02.28 and 1975.05.26 events. Previous results of SWAN propagation along the Portuguese coast with instrumental data can be found in Heinrich et al., (1994) and Gjevik et al (1997). Research undertaken on tsunamigenic impacts in Portugal heavily relies on the historical record, which corresponds to a short time series in comparison with the long recurrence interval that may characterize events of extreme tsunami flooding.

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The preliminary results obtained show good agreement between the flooded zones inside estuary and correspond to those where there is sedimentological evidence of two events; 1531 and 1755.