Tsunami potential of the 1912 Mürefte earthquake (M 7.4) in the Sea of Marmara; North Anatolian Fault, Turkey

Baptista, M. A.(1), Aksoy, M. E.(1, 2), Ferreira, H.(1), Uçarkuş, G. (3), Miranda J.M. (1), Gasperini, L., (4), Meghraoui, M. (5)

(1) IDL-CGUL, Universidade de Lisboa, Campo Grande, Edificio C8, 1749 - 016 Lisboa, Portugal.
(2) Dept. of Geological Engineering, Muğla Üniversitesi, Kötekli - 48000, Turkey
(3) Scripps Institution of Oceanography, San Diego, CA, United States
(4) Istituto di Scienze Marine, CNR Bologna, Italy
(5) Institut de Physique du Globe, UMR 7516, Université de Strasbourg, France
Corresponding Author: Baptista, M.A., (mavbaptista@gmail.com)

The 9 August 1912 Mürefte Earthquake M 7.4 is one of the largest destructive earthquakes of the 20th century, in the Balkan region, that occurred on the westernmost segment of the North Anatolian Fault (NAF). The tremor struck at 03:30 a.m. and was felt in a wide region including Greece and Bulgaria. Damage occured mostly in the western part of the Sea of Marmara, between Tekirdag and Çanakkale with maximum intenstiy IX-X MSK near the Mürefte village. Destruction killed 2800 people and injured 7000 more. It totally destroyed 12.600 houses, damaged 12.100 beyond repair and caused serious damage to another 15.400.

The westernmost segment of NAF is limited by the Marmara Sea and the Aegean Sea on both ends. The 1912 earthquake resulted with major surface faulting and co-seismic slip all along the on land and offshore sections. Up to date several faulting scenarios were proposed for this event claiming surface ruptures ranging from 50- 150 km.

The tsunami reports of this event are limited. Contemporary accounts report several onshore and offshore natural events that can be related to a tsunami caused by submarine surface faulting. Receding of the sea and inundations were observed along the northern shores of the Sea of Marmara after the earthquake. Besides, most of the coastal area of the Strait of the Dardanelles (Çanakkale) experienced flooding. Strong sea waves hit the northern coasts of Hayırsız Ada and at Yeşilköy (near Istanbul) a rowing-boat has been lifted up to a height of 2.7 m. Here, we present a summary of the tsunami observations and perform tsunami numerical simulations using a nonlinear shallow water code (NSLW7) that uses an explicit leap-frog finite difference scheme to solve the non-linear shallow water equations and high resolution DEM (Digital Earth Model) including bathymetry and topography in order to compute inundation. The initial condition of the tsunami propagation model is the static vertical displacement of the ocean floor due to the submarine earthquake that is computed Mansinha and Smylie (1971) homogenous elastic half space approach, as implemented in the Mirone suite (Luis, 2007). The parameters used in this computation are obtained by the earthquake fault geometry and slip distribution. The source is composed by 8 segments of variable length with dip angles varying between 70 to 85 and an average slip of 3 m. Preliminary results show maximum wave heights along the northern coast of the Sea of Marmara, Saros Gulf and Marmara Island according to the historical reports.

This study was supported by Instituto Dom Luiz - LA, Universidade de Lisboa

WITHDRAWN