

COMPLEX GEOPHYSICAL STUDIES CONCERNING THE PROBABILITY OF TSUNAMI GENERATION TRIGGERED BY THE ISTANBUL SEISMIC SOURCE

Partheniu Raluca¹, Craiu Andreea¹, Diaconescu Mihail¹

¹*National Institute of Research and Development for Earth Physics*

Abstract

Previous studies have shown that the Black Sea was subject to tsunami waves generation in the past (Altinok Y., 1999), with a total of 22 events generated. According to recent studies provided by Diaconescu M. et al. (2008), the Black Sea is divided in 9 seismic sources. A more recent approach structures the area in 10 different seismic sources, given by Moldovan I. et al. (2014). This study focuses mostly on the Istanbul seismic source, which triggered in the past high magnitude earthquakes followed by tsunami waves.

The most recent event generated in the Black Sea was on 15th of October 2016, with a magnitude $M_w=5.3$, at a depth of 10 km, with the following location: Latitude 42.19° N, Longitude 30.68° E. The focal mechanism determined through the moment tensor inversion (taken from U.S. Geological Survey - USGS) indicates a reverse faulting type. For this event, few tsunami modeling scenarios were run, increasing the magnitude with steps of 0.2, from 7.0 up to 7.8. The modeling was accomplished using the Tsunami Analysis Tool (TAT), software provided by the Joint Research Center (JRC) from Ispira, Italy.

The results of these tsunami simulations show low wave heights for a magnitude of 7.2, of maximum 0.42 m in Eregli (Turkey), 0.36 m in Zonguldak Eregli (Turkey), and 0.32 m in Kilimli (Turkey). For a magnitude of 7.6, the maximum wave heights are higher, considered to be moderate, of 1.59 m in Zonguldak Eregli (Turkey), 1.21 m in Eregli (Turkey). Moreover, there are 3 locations from the Romanian shoreline affected, as follows: 0.83 m in Mangalia, 0.5 m in Techirghiol and 0.39 m in Constanta.

In order to obtain a comparison of these simulations to real events of high magnitude, we will correlate them to two past earthquakes from the Istanbul seismic area, generated on 12th of November 1999 ($M_w=7.2$) and 17th of August 1999 ($M_w=7.6$). Due to their location inland, the results for these two earthquakes display very low wave heights, of maximum 0.18 m. These events were also modeled using the same software same methodology. Considering the offshore prolongation of the faults they were generated on, the results were compared to those of the M 5.3 earthquake.

For a better evaluation of the tsunami waves possibility of occurrence in the Istanbul seismic area, more information regarding the parameters of high magnitude earthquakes, their location and focal mechanism type, are necessary.

Keywords: earthquake, Black Sea, tsunami modeling