

Assessment of tsunami hazard for coastal areas of Shandong Province, China

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Shandong province is located on the east coast of China and has a coastline of about 3100 km. There are only a few tsunami events recorded in the history of Shandong Province, but the tsunami hazard assessment is still necessary as the rapid economic development and increasing population of this area. The objective of this study was to evaluate the potential danger posed by tsunamis for Shandong Province. The numerical simulation method was adopted to assess the tsunami hazard for coastal areas of Shandong Province. The Cornell multi-grid coupled tsunami numerical model (COMCOT) was used and its efficacy was verified by comparison with three historical tsunami events. The simulated maximum tsunami wave height agreed well with the observational data. Based on previous studies and statistical analyses, multiple earthquake scenarios in eight seismic zones were designed, the magnitudes of which were set as the potential maximum values. Then, the tsunamis they induced were simulated using the COMCOT model to investigate their impact on the coastal areas of Shandong Province. The numerical results showed that the maximum tsunami wave height, which was caused by the earthquake scenario located in the sea area of the Mariana Islands, could reach up to 1.39 m off the eastern coast of Weihai city. The tsunamis from the seismic zones of the Bohai Sea, Okinawa Trough, and Manila Trench could also reach heights of >1 m in some areas, meaning that earthquakes in these zones should not be ignored. The inundation hazard was distributed primarily in some northern coastal areas near Yantai and southeastern coastal areas of Shandong Peninsula. When considering both the magnitude and arrival time of tsunamis, it is suggested that greater attention be paid to earthquakes that occur in the Bohai Sea. In conclusion, the tsunami hazard facing the coastal area of Shandong Province is not very serious; however, disasters could occur if such events coincided with spring tides or other extreme oceanic conditions. The results of this study will be useful for the design of coastal engineering projects and the establishment of a tsunami warning system for Shandong Province.