Greek and Turkish coastlines have been exposed to devastating tsunamis in the past. The first historical report of coastal inundation by tsunami refers to the eruption of the Thera volcano in the eastern Mediterranean. It is posited this volcanic tsunami as the primary agent for the demise of the Minoans in Crete. However, his hypothesis was not favored now because of differences in the relative dating of the eruption with the destruction of the palaces. Now, it is believed that demise of the Minoans is around 1620 BC. But, most likely, the tsunami destroyed the Minoan marina and ships and flooded their fields and warehouses precipitating the demise of the Minoans. Today, both countries have densely populated shorelines with substantial touristic activities and critical infrastructures. Thus, the establishment of a tsunami propagation database in the Aegean Sea can help to build a capacity to develop for both long- and short-term tsunami-forecasting capabilities in the region. Potential tsunamiigenic sources can be modeled using pre-computed tsunami scenario databases that can be used for long-term studies including inundation mapping for the tsunami prone coastal zones, probabilistic studies; or short-term, i.e., real-time forecasting.

**Introduction**

The United States National Oceanic and Atmospheric Administration (NOAA) Center for Tsunami Research (NCTR) at Pacific Marine Environmental Laboratory developed tsunami propagation database covering the world oceans. NCTR’s tsunami propagation database is based on propagation results from 100 x 50 km² fault planes with a slip value of 1 m referred to as tsunami unit sources. Subduction zones and known faults are modeled as sets of unit source, while the linearity of tsunami propagation in the open sea allows scaling or combination of the pre-computed propagation results from tsunami unit sources to generate a desired seismic scenario. We follow NCTR approach to develop propagation database for the Aegean Sea. We consider the Hellenic Arc subduction zone and other seismic faults and historical tsunami events compiled from the tsunami catalogues for the Aegean Sea. We placed 100 x 50 km² sources covering subduction zones, while adopted 50 x 25 km² sources for local faults (Figure 1).

**Unit Tsunami Sources for the Aegean Sea**

Accurate forecasting of the tsunami impact on a coastal community largely relies on the usage of validated and verified tsunami numerical model as explained. In addition, accurate bathymetry and topography are crucial inputs to develop a forecast model (FM), especially for inundation calculation. The high spatial and temporal grid resolution necessary for modeling accuracy poses a challenge in the run-time requirement for real-time forecasts. The FM needs to utilize the most recent bathymetry and topography available to reproduce the correct wave dynamics during the inundation computation. The FM consists of three telescoping grids with increasing spatial resolution and, consequently, temporal resolution for simulation of wave inundation onto dry-land. Referred to as A-, B-, and C-grids (Figure 2), each of which becomes successively finer in resolution as they telescope into the population and economic center of the community of interest, here town of Fethiye. Offshore is covered by the largest and lowest resolution A-grid while the near-shore details are resolved within the finest scale C-grid to the point that signal from incoming waves are resolved within expected accuracy limits. The procedure is to start with large spatial extent merged bathymetric topographic grids at high resolution and then these grids are optimized coarsening the grid resolution and/or reducing the modeling region—the grid size—allowing for the significant portion of the modeled tsunami waves to pass through the model domain without too much signal degradation. This final model is referred to as the FM. The stability and sensitivity of FM is investigated by simulating mega, medium and micro tsunami. The good stability of the FM is observed and this guarantees its reliability. One example result is shown in Figure 3.

**Forecast Model for Fethiye, Turkey**

Accurate forecasting of the tsunami impact on a coastal community largely relies on the usage of validated and verified tsunami numerical model as explained. In addition, accurate bathymetry and topography are crucial inputs to develop a forecast model (FM), especially for inundation calculation. The high spatial and temporal grid resolution necessary for modeling accuracy poses a challenge in the run-time requirement for real-time forecasts. The FM needs to utilize the most recent bathymetry and topography available to reproduce the correct wave dynamics during the inundation computation. The FM consists of three telescoping grids with increasing spatial resolution and, consequently, temporal resolution for simulation of wave inundation onto dry-land. Referred to as A-, B-, and C-grids (Figure 2), each of which becomes successively finer in resolution as they telescope into the population and economic center of the community of interest, here town of Fethiye. Offshore is covered by the largest and lowest resolution A-grid while the near-shore details are resolved within the finest scale C-grid to the point that signal from incoming waves are resolved within expected accuracy limits. The procedure is to start with large spatial extent merged bathymetric topographic grids at high resolution and then these grids are optimized coarsening the grid resolution and/or reducing the modeling region—the grid size—allowing for the significant portion of the modeled tsunami waves to pass through the model domain without too much signal degradation. This final model is referred to as the FM. The stability and sensitivity of FM is investigated by simulating mega, medium and micro tsunami. The good stability of the FM is observed and this guarantees its reliability. One example result is shown in Figure 3.

**Inundation Modeling for Heraklion, Crete**

For Greece, the research team FORTH, chose the island of Crete and in particular the city of Heraklion which is the biggest city of Crete. Some of the largest known historical earthquakes in the Eastern Mediterranean are located near Crete (Figure 4). Although tsunamis are rare events and it could be argued that the possibility of a tsunami is small, Crete is located on the edge of the subduction zone of the Hellenic Arc that has some of the most active seismic fault lines in the world. This fact makes the island of Crete a potential target of a tsunami. Therefore, preliminary version of the inundation map for the town of Heraklion was developed (Figures 5-6).

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**References**


