

# Tsunami Hazard Evaluation of the Eastern Mediterranean: Historical Analysis and Selected Modeling

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**Abstract** Seismic sea waves in the eastern Mediterranean have been reported since written history first emerged several thousand years ago. We collected and investigated these ancient and modern reports to understand and model the typical tsunamigenic sources, with the ultimate purpose of characterizing tsunami hazard along the Levant coasts. Surprisingly, only 35% of the tsunami reports could be traced back to primary sources, with the balance remaining questionable. The tsunamis varied in size, from barely noticeable to greatly damaging, and their effects ranged from local to regional. Overall, we list 21 reliably reported tsunamis that occurred since the mid second century B.C. along the Levant coast, along with 57 significant historical earthquakes that originated from the “local” continental Dead Sea Transform (DST) system. An in-depth evaluation shows that 10 tsunamis are clearly associated with on-land DST earthquakes, and therefore, as formerly suggested, they probably originated from offshore, seismogenically induced slumps. Eight tsunamis arrived from the “remote” Hellenic and Cypriot Arcs, one from Italy, and two are left with as yet unrecognized sources. A major conclusion from this work is that onshore earthquakes commonly produce tsunamis along the Levant coastline, and that analogous situations are present elsewhere in the Mediterranean, as well as along the California coast and in another regions with active faults near the coast.

We modeled three typical scenarios, and in light of the Sumatra experience, we examined the more likely severe magnitudes. This of course leads us toward the upper range of expected run-ups. The models show that sooner than five minutes after a strong earthquake produces an offshore slump, which occurs after close to a third of the large DST earthquakes, a 4- to 6-m run-up may flood part of the Syrian, Lebanese, and Israeli coasts. Tsunamis from remote earthquakes, however, arrive later and produce only 1- to 3-m run-ups, but are more regional in extent.

*Online material:* Tsunami modeling and reports.

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