



Preliminary Evaluation of Tsunami Hazard in the Gulf of Elat-Aqaba Head, Red Sea

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The Gulf of Elat-Aqaba at the northernmost tip of the Red Sea is located along the southern part of the Dead Sea Transform and is subject to strong and destructive earthquakes. Consequently, there is potential of tsunami hazard due to co-seismic deformation and submarine landslides. The tsunami that followed the 1995 Nuweiba, Mw7.2 earthquake was witnessed and recorded, and thus emphasizes this hazard. The populated cities of Elat and Aqaba nearby the Gulf Head host intensive tourist and commercial activities and expect large infrastructure projects. Yet, tsunami hazard evaluation has not been done there.

To evaluate the hazard we first characterized the potential tsunamigenic earthquakes and submarine landslides, mapped its areal distribution, and estimated its source parameters, geometrical dimensions and return periods. In parallel we adopted the GeoClaw tsunami modelling software and built a grid of the bathymetry and topography of the investigated area. We then examined the 1995 tsunami field evidences and mareogram as our benchmark, found a good agreement and thus validated the GeoClaw for our purposes. The main effort was the running of conceptual scenarios that represent the most severe tsunamigenic earthquakes in the Gulf. It appears that the rupture of the marginal faults along the Elat Basin poses the worst case scenarios. We thus simulated the Elat Fault scenario and found about 5 m wave-height along the coast. Moreover, this scenario imposes co-seismic subsidence that may worsen the tsunami inundation, and can trigger a tsunamigenic submarine landslide, not to mention the severe shaking. To complement the evaluation we simulated a generic tsunamigenic submarine slump offshore Elat and received about the same wave-height as well.

Overall we recommend adopting a tsunami wave-height of 5 meters as the leading parameter for tsunami preparedness. We also applied the 'Attenuation Model' and produced a preliminary inundation hazard map. The return period of a significant tsunami event is estimated at about 500 years. The warning time is a few minutes only and thus the earthquake shaking should be the tsunami warning, although false alarms are inevitable.

All the cities along the Elat-Aqaba Gulf Head are exposed to earthquake and tsunami hazards. To raise the public awareness we prepared a draft of education program that includes supporting presentation, outlines for discussion and a questionnaire that evaluates the level of awareness of the public-at-risk from a tsunami, to be implemented in local schools, public institutions and tourist centers and hotels.