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Tsunami Hazard Assessment along the Coast of Oman from Near- and Far-field Tectonic Sources

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Coastal areas of Oman are exposed to tsunami threat associated with earthquakes generated in two major subduction zones, namely Makran and Sumatra. Both zones were responsible of triggering tsunamis that reached/impacted Oman coast. The Mw8.1 earthquake event of 1945, occurred in Makran zone, has caused a tsunami that was reported to affect the coast of Oman. The Mw9.2 Indian Ocean event of 2004 triggered a tsunami that was recorded in various tide-gauges stations of Oman with wave amplitude reaching $\sim$1.7m in the port of Salalah.

This work aims to assess tsunami hazard along the Oman coast considering both deterministic and probabilistic approaches. Deterministic approach uses particular source scenarios (most credible and/or worst case) from Makran and Sumatra subduction zones and computes the tsunami coastal impact through numerical modeling of expected waveforms, maximum wave heights distribution, and site-specific inundations. While, probabilistic approach includes the contribution of small and large sources and employs the probabilistic seismic hazard assessment together with the numerical modeling to evaluate the likelihood that a certain level of tsunami threat is exceeded at a certain location of Oman coast within a certain period of time.

We present deterministic results in terms of regional scale distribution of maximum wave heights, tsunami waveforms computation, and inundation maps for a selected coastal area. For probabilistic assessment, we derive 250- and 500-years probability hazard exceedance maps and hazard curves for the Oman coast. The hazard maps consist of computing the likelihood that tsunami waves exceed a specific amplitude for the entire coast of Oman, and the hazard curves describe the variation of cumulative probabilities as function of wave amplitudes at some critical coastal points. Finally, we discuss the usefulness of obtained results for tsunami mitigation in Oman.

Keywords: Tsunami, Oman, Deterministic approach, Probabilistic approach.