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The 1945 Balochistan earthquake and probabilistic tsunami hazard assessment for the Makran subduction zone

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Iran and Pakistan are countries quite frequently affected by destructive earthquakes. For instance, the magnitude 6.6 Bam earthquake in 2003 in Iran with about 30'000 casualties, or the magnitude 7.6 Kashmir earthquake 2005 in Pakistan with about 80'000 casualties. Both events took place inland, but in terms of magnitude, even significantly larger events can be expected to happen offshore, at the Makran subduction zone. This small subduction zone is seismically rather quiescent, but a tsunami caused by a thrust event in 1945 (Balochistan earthquake) led to about 4000 casualties. Nowadays, the coastal regions are more densely populated and vulnerable to similar events. Additionally, some recent publications raise the question of the possiblity of rare but huge magnitude 9 events at the Makran subduction zone.

We first model the historic Balochistan event and its effect in terms of coastal wave heights, and then generate various synthetic earthquake and tsunami catalogs including the possibility of large events in order to asses the tsunami hazard at the affected coastal regions. Finally, we show how an effective tsunami early warning could be achieved by the use of an array of high-precision real-time GNSS (Global Navigation Satellite System) receivers along the coast.