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Tsunami science impacting Costa Rica: past, present and future

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Though an infrequent threat, tsunamis might have devastating effects in any coast in the world. Since 1746, Costa Rica has registered 42 tsunamis from local and distant sources in both shores, Pacific and Caribbean. At least 15 of those tsunamis caused damaging currents and/or flooding, and one caused at least three deaths. Still, the relatively moderate effects that those tsunamis had, together with the moderate seismic potential for the country, explains the popular belief that tsunamis are not a threat for Costa Rica. During the past 30 years, coastal development and tourism have largely increased at both Pacific and Caribbean coasts, thus increasing the tsunami vulnerability. Here we present the tsunami science that has been done in Costa Rica in the past decade, its impact and how are we planning to address its shortages. Tsunami hazard assessments were performed in both shores using seismic sources with homogeneous slip and considering both local and distant sources. The results for the Pacific showed that distant tsunamis might cause larger inundation than local tsunamis; but arrival times for local tsunamis might be as short as 2 minutes. For the Caribbean, depending on location, local sources might cause larger inundation than regional sources, again with arrival times as small as 5 minutes. Thus, the tsunami threat for Costa Rica is not negligible, neither from local nor distant sources at both shores. A tsunami with the characteristics of past tsunamis might have a much larger impact nowadays. Based on the results of those studies, Costa Rica has started implementing tsunami preparedness measures, aligned with the four pillars of the Ocean Decade Tsunami Program (ODTP): Risk Knowledge; Detection, Analysis and Forecasting of Tsunamis and Associated Hazardous Consequences; Warning Dissemination and Communication; and Preparedness and Response Capabilities. As a result, tsunami awareness has increased nationwide, about one in five coastal communities have at least a tsunami evacuation map, and 11 communities have been recognized as IOC/UNESCO Tsunami Ready. Still, much work is needed, both in preparedness and in scientific research. New tsunami hazard assessments should consider seismic sources with heterogeneous slip and probabilistic approaches, together with non-seismic sources, to refine the characterization of the threat for both shores and ensure preparedness is based on the best science available.