

Application of multiple proxies in Mexican tropical coasts to prove evidence of tsunami deposits

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The study of tsunami deposits has significantly advanced since the Chilean 2010 and Tohoku 2011 tsunamis providing opportunities to analyze tsunami deposits and their characteristics (Rubin *et al.*, 2017). In tropical environments, the combination of multiple proxies has demonstrated to be a necessity to prove evidence of ancient earthquakes and tsunamis (Ramírez-Herrera *et al.*, 2012, 2016; Williams *et al.*, 2011). Challenges faced in the study of tsunami deposits in tropical areas frequently affected by hurricanes, lead to problems of differentiation between tsunami and storm deposits, and misinterpretations of climate/seasonal changes.

Ocampo-Ríos *et al.* (2017) attempted to study the geologic evidence of the 1985 tsunami in Barra de Potosí, México. Their assertion that an "erosive base" is the only tool to prove the existence of tsunami deposits is not correct. (1) Our previous work in the Barra de Potosí area (field and survey-based interviews to witnesses of the 1985 tsunami) indicate that the area around the village has been intervened by human activity, thus surficial sediments are not reliable. (2) Beaches are very dynamic, and are located where normally tsunami erosion occur, thus, this type of environments are not suitable for tsunami deposits preservation. (3)

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Ramírez-Herrera *et al.* (2012) research results come from sites in the Ixtapa estuary and not from Zihuatanejo Bay, i.e. a completely different geomorphic setting that consequently changes the tsunami impact and distribution of tsunami deposits. Thus, comparison by Ocampo-Ríos *et al.* (2017) with their sites is inadequate. (4) Ocampo-Ríos *et al.* (2017) hydraulic roughness calculation (0.02) to determine the inundation limit shows inaccuracies. Values from 0.011 to 0.02 apply to flood plains with very irregular shape which is not the case for Ixtapa estuary studied by Ramírez-Herrera *et al.* (2012) nor is the Zihuatanejo Bay. The calculation of Manning's values for the specific location (using the local topography, vegetation density, presence of barriers, etc.) is more appropriate than using standardized Manning's values. We reassessed here the tsunami flooding area interpreted by Ocampo-Ríos *et al.* (2017) using their data and demonstrate that their results are not correct, the inundation continues beyond 700 m in both Zihuatanejo and Barra de Potosí areas. (5) . Mineral content and assemblages are source-dependent and therefore, they are not a useful tool alone to identify tsunami deposits (Jagodzinski *et al.*, 2012). (6) Except for the Br concentration values, Ocampo-Ríos *et al.* (2017) do not show significant differences in the elemental composition of the "pre-tsunami" and "tsunami deposits". The explanation provided on the low concentrations of Na, Cl and Br is not plausible. These elements have been widely used to identify marine provenance on sediment paleorecords along coastal areas. Br concentrations on soils can vary from 5 to 40 ppm, while on marine sediments they can reach up to 300 ppm (e.g. Ruiz-Fernández *et al.*, 2016). The oxides used to demonstrate tsunami origin of the Barra de Potosí sediments named "tsunami deposits", i.e. SiO₂ and TiO₂, if there was in fact any significant difference in values, would prove terrigenous characteristics and origin, and not marine. In summary, multiple proxies are required to prove evidence of tsunami deposits.

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