



Geological record of marine tsunami-backwash: The role of the hydraulic jump

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Tsunamis are marked by distinct phases of uprush during coastal inundation and backwash when tsunami water recedes. Especially in the case of a steep coastal profile, the return flow may operate in a Froude-supercritical regime, eroding the flooded area and transporting large volumes of sediment seawards. Important sediment accumulation occurs when the supercritical flow goes through a hydraulic jump where it becomes subcritical upon deceleration. An inferred example in coarse-grained, mixed carbonates from the Lower Pleistocene on Rhodes (Greece) is described, with offshore bars up to 10 m long with scour-and-fill structures and steep antidune stratification. In finer-grained sandy depositional systems such structures may be much longer, up to hundreds of metres. It is suggested here that, analogous to some turbidite beds, the apparent lack of structures or the presence of faint stratification that is common for graded sand layers within marine tsunamiites may in fact consist of extremely low-angle, landward-dipping backset-strata that formed under a landward-migrating hydraulic jump during the basinward retreat of tsunami water. Numerical simulations that focus on the internal stratification of backwash-generated offshore bars support this hypothesis. The recognition of such deposits in the sedimentary record enlarges the toolbox for assessing the past frequency of tsunamis in coastal areas.