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Where to look for tsunami deposits? A case study from the Santorini related tsunami and the 1956 tsunami at Palaikastro, Crete

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Searching within the shallow offshore zones for preserved tsunamiginic deposits has been demonstrated as a worthwhile and important means to identify and study its tsunami events. For example, research at Caesarea Maritima, Israel, recognized tsunamigenic deposits in shallow (less than 30 m) upper shelf offshore deposits, while the on-land signature of the same events were still unidentified. In Palaikastros, Crete, Late Minoan period layers were reported on coastal cliffs, and eye-witness observations described tsunami run-up and inundation following the 1956 Amorgos earthquake. In an effort to find remnant deposits from these tsunami events, four cores were collected offshore. The cores were collected from different marine settings (which include river influence, posidonia rich seafloor, micro-morphological changes, etc.). On-land samples were also collected for comparison. Results from the offshore cores reveal two distinctive anomalous horizons. The deeper and older disturbance is most probably the post-depositional sedimentation just above the Santorini eruption deposit, and the shallower disturbance represents the 1956 AD tsunami event. Interestingly, no sedimentological evidence for the 1956 tsunami event was noticed in the coastal backshore. The sedimentological signatures of the two tsunami events were very different in the cores collected from the varied marine settings. In the cores collected immediately offshore from the river, the 1956 event is marked by what appears to be a massive flood-like deposit, rather than the coarse deposits seen elsewhere. Cores in the area of the posidonia-rich seafloor had the most subtle variations that could only be speculatively associated to the tsunamigenic layers. The Santorini tsunami sedimentological signatures in these cores were not significant. It is possible that the layers were reworked and washed away following their deposition, or rather, affected from stream inflow or sediments turbidation in posidonia-rich regions, and back channel flow erosion in close-to-river sediments. We conclude that certain offshore morphological features apparently constitute a significant hindrance for tsunami sediment deposition and preservation in the shallow shelf regions. We encourage offshore tsunami research and suggest attempting future offshore tsunami studies, recommending the selection of the most homogeneous offshore areas (vegetation-free and far-from-river influence areas and with less morphological and sedimentological diversity), this might allow for more distinctive signatures and easier interpretation.