

The 365 AD tsunami imprint on the coasts of southwestern Crete – Sougia and Palaiochora case studies

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The southwestern coast of Crete, one of the most seismically active regions in Europe, is supposed to have been uplifted by up to 9 m during the mega-earthquake that struck the eastern Mediterranean world on July 21, 365 AD. An associated tsunami event is known to have caused thousands of fatalities and destroyed many coastal settlements and infrastructure between the Levante in the east and the Adriatic Sea in the northwest. Since this event, the entire southwestern coast of Crete has experienced strong erosion so that near-coast geological archives showing relevant Holocene sedimentary records are rare. So far, distinct palaeotsunami fingerprints from coastal archives in this region were unknown.

A multi-proxy study including sedimentological, geochemical, geochronological and microfaunal methods was conducted at Sougia, within an ancient harbour basin, and around the promontory of Palaiochora. Detailed multi-electrode geoelectrical studies and several near-coast vibracores helped to detect promising local sedimentary archives. In addition, prominent elevated shorelines, evidenced by notches and algal rims, were measured with DGPS.

Sedimentary archives found at Sougia and Palaiochora revealed distinct sedimentological, geochemical and geomorphological traces of high-energy inundation from the marine side. At Sougia, we found a sheet of allochthonous marine sand, partly cemented, intersecting silt-dominated harbour deposits. At Palaiochora, we found high-energy channels eroded in the local bedrock and filled with marine-borne sand and gravel on top of the Palaiochora isthmus, today some 400 m inland. Based on geochemical and microfaunal fingerprints and on sedimentary features, high-energy deposits are interpreted as tsunamites. ¹⁴C-AMS- and OSL dating approaches revealed that the tsunami sequences from both Sougia and Palaiochora were deposited during the 365 AD tsunami event. We also present and discuss conceptual tsunami landfall scenarios for both study sites.