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The AD 365 earthquake: high resolution tsunami inundation for Crete and full scale simulation exercise

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In the eastern Mediterranean, historical and archaeological records document major earthquake and tsunami events in the past 2000 year (Ambraseys and Synolakis, 2010). The 1200km long Hellenic Arc has allegedly caused the strongest reported earthquakes and tsunamis in the region. Among them, the AD 365 and AD 1303 tsunamis have been extensively documented. They are likely due to ruptures of the Central and Eastern segments of the Hellenic Arc, respectively. Both events had widespread impact due to ground shaking, and e triggered tsunami waves that reportedly affected the entire eastern Mediterranean. The seismic mechanism of the AD 365 earthquake, located in western Crete, has been recently assigned a magnitude ranging from 8.3 to 8.5 by Shaw et al., (2008), using historical, sedimentological, geomorphic and archaeological evidence. Shaw et al (2008) have inferred that such large earthquakes occur in the Arc every 600 to 800 years, with the last known the AD 1303 event.

We report on a full-scale simulation exercise that took place in Crete on 24-25 October 2011, based on a scenario sufficiently large to overwhelm the emergency response capability of Greece and necessitating the invocation of the Monitoring and Information Centre (MIC) of the EU and triggering help from other nations . A repeat of the 365 A.D. earthquake would likely overwhelm the civil defense capacities of Greece. Immediately following the rupture initiation it will cause substantial damage even to well-designed reinforced concrete structures in Crete. Minutes after initiation, the tsunami generated by the rapid displacement of the ocean floor would strike nearby coastal areas, inundating great distances in areas of low topography. The objective of the exercise was to help managers plan search and rescue operations, identify measures useful for inclusion in the coastal resiliency index of Ewing and Synolakis (2011).

For the scenario design, the tsunami hazard for the AD 365 event was assessed for the biggest island lying in proximity of the Hellenic Arc, namely Crete. High resolution tsunami inundation modelling was performed for Heraklion and Chania. We use MOST, a non-linear finite difference hydrodynamic model thoroughly benchmarked, coupled with accurate bathymetry and topography data. Also, we used empirical attenuation relationships to estimate the effects of ground shaking on infrastructure complementing the scenario design.

Tsunami inundation and ground acceleration maps are presented for the study areas, providing valuable information for earthquake and tsunami hazard.

References

Ambraseys, N. and Synolakis, C.E., (2010) Tsunami catalogs for the Eastern Mediterranean, Revisited, Journal of Earthquake Engineering, 14 (3), 309-330, DOI: 10.1080/13632460903277593.

Ewing, L. and Synolakis, C. (2011) Coastal Resilience: Can We Get Beyond Planning the Last Disaster, Coastal Disasters, 2011, ASCE Conf. Proc. doi:10.1061/41185(417)79

Shaw, B., Ambraseys, N., England, P., Floyd, M., Gorman, G., Higham, T., Jackson, J., Nocquet, J., Pain, C., and Piggott, M. [2008] 'Implications of the great earthquake of AD 365 for tectonics and tsunami hazard in the eastern Mediterranean,' Nature Geoscience 1 268–276.