Plinius Conference Abstracts
Vol. 13, Plinius13-38, 2011
13th Plinius Conference on Mediterranean Storms

Tsunamis versus extreme wave events: a geomorphological approach for discriminating boulder deposition processes in two Mediterranean areas.

M. Vacchi (1,2), A. Rovere (1,2), N. Zouros (3), and M. Firpo (1)

(1) DIPTERIS, University of Genoa, Genoa (Italy), (2) SEAMap srl Environmental consultancy, Academic spinoff, Genoa (Italy), (3) Department of Geography, University of the Aegean, Mytilene (Greece)

Tsunamis and extreme waves are one of the largest threats for coastal areas, especially in territories where modern social development has led to an increase of coastal population.
On one hand, tsunami warning or extreme wave prediction systems have been put in place since the early 20's as networks for detection and communication to issue timely alarms to allow evacuation of coastal areas. On the other hand, the definition of coastal tracts subject to different degrees of hazard is left to historic datasets. These can be quantitative (i.e. measured data for the last century) or qualitative (i.e. data inferred indirectly for the last few thousands years).
In this perspective, geological markers of tsunamis or exceptional storm waves along coastal tracts give a substantial contribution to the definition of long-termed datasets related to the occurrence of past catastrophic events. A large range of literature deals with the mechanisms triggering tsunamis, mainly addressing their geographical origin, wave propagation and deformation. Although easier in the Mediterranean, distinguishing between tsunamis and extreme storms from geological markers remains a difficult task, although this topic has been addressed by different authors.
In this study, field surveys were aimed to identify and assess the main characteristics (dimensions, weight, position along the coast) of boulder deposits found along two Mediterranean shorelines. One is located in the Aegean Sea (Lesvos Island, Greece), the other in the Ligurian Sea (Savona Province, Italy). These localities are different from hydrodynamic, geological, geomorphologic and socio-economic point of view. Data were processed using two recently published hydrodynamic approaches in order to quantify the waves necessary to displace the boulders in the two areas. On the basis of the pre-transport settings identified, values of Storm wave height (Hs) and Tsunami wave height (Ht) theoretically required for the boulder displacement were calculated in the two areas. Where present, marine biological remains were sampled and dated with radiocarbon to identify the age of the event, and historical photographs analyzed to gather details of coastal changes.
The results support the hypothesis that the boulders in Lesvos (Greece) where settled on the coast by a tsunami triggered by the Chios-Karaburum earthquake of 1949. Some of them where after re-oriented by exceptional storms occurred after their emplacement. The results obtained for boulders near Savona (Italy) provide suggestive evidence that they were settled during a severe storm occurred in the last 10 years. Nevertheless, geological and morphological data suggest that the continental shelves and slopes of this area can be subjected to sediment mass failure, potentially leading to tsunami events.