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CLASSIFICATION OF TSUNAMI HAZARD ALONG THE SOUTHERN COAST OF INDIA: AN INITIATIVE TO SAFEGUARD THE COASTAL ENVIRONMENT FROM SIMILAR DEBACLE

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Abstract

Prevention of natural disasters is not feasible but the destruction it conveys could be minimized at least to some extent by the postulation of reliable hazard management system and consistent implementation of it. With that motive, the beaches along the study area have been classified into various zones of liability based upon their response to the tsunami surge of 26 December 2004. Thereby, the beaches which are brutally affected has been identified and the beaches which are least. Based on the seawater inundation with relative to their coastal geomorphic features, we have classified the tsunami impact along the coast and the probability of the behaviour of the beaches in case of similar havoc in future. The maximum seawater inundation recorded in the study area is 750 m as in the case of Colachel and the minimum is 100 m as in the case of Kadiapatanam, Mandakadu and Vaniakudy. Beaches like Chinnamuttom, Kanyakumari, Manakudy, Pallam and Colachel are under high risk in case of similar disaster in future and the beaches like Ovari, Perumanal, Navaladi, Rajakkamangalam, Kadiapatanam, Mandakadu, Vaniakudy, Inayam and Taingapatnam are under least viability.

TSUNAMI IMPACTS ON MORPHOLOGY OF BEACHES ALONG SOUTH KERALA COAST, WEST COAST OF INDIA

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ABSTRACT

The present study is based on the post tsunami survey conducted in January 2005 along the southwest coast of India. Although tsunami affected the whole coastline of Kerala, it devastated the low-lying coastal areas of Kollam, Alleppey and Ernakulam districts leading to the loss of life and property. This paper illustrates the variation of tsunami intensity along the coasts of these districts and the consequent morphological changes occurred in the coastal area during tsunami. Topographic survey data showed that the coastal inundation was rampant along the worst affected regions where the coastal areas are like a narrow strip of land of width 100-400m, lying between the Arabian Sea and the backwaters and the down slope of the coastal area increases towards the backwater side. The data on run-up height showed a variation of 1.9 – 5 m along the study area. Post tsunami beach profiles showed erosion of the foreshore and backshore and landward transport of beach material during the run-up of waves at Puthu-Vypeen. The erosion of the backshore (berm) in several places along the coast was quite evident in the study. This has caused reduction in the elevation which may make these areas more vulnerable to breaching by the high waves, particularly during the monsoon and also during certain spring tides which is a matter of serious concern.

TSUNAMI RISK SITE DETECTION IN GREECE BASED ON REMOTE SENSING AND GIS METHODS

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ABSTRACT

Based on LANDSAT ETM and Digital Elevation Model (DEM) data derived by the Shuttle Radar Topography Mission (SRTM) of the coastal areas of Greece were investigated in order to detect traces of earlier tsunami events. Digital image processing methods used to produce hillshade, slope, minimum and maximum curvature maps based on the SRTM DEM data contribute to the detection of morphologic traces that might be related to catastrophic tsunami events. These maps combined with LANDSAT ETM and seismotectonic data in a GIS environment allow the delineation of coastal regions with potential tsunami risk. The evaluations of LANDSAT ETM imageries merged with digitally processed and enhanced SRTM data clearly show areas that must have been flooded in earlier times. In some cases morphologic traces of waves as curvilinear scarps open to the sea-side are clearly visible.

THE ORPHAN TSUNAMI OF 1700

By:

Brian F. Atwater, Musumi-RokkakuSatoko, Satake Kenji, Tsuji Yoshinobu, Ueda Kazue and David K. Yamaguchi

A REVIEW

By:

George Pararas-Carayannis

REVIEW SUMMARY

"Orphan Tsunami of 1700" is a beautifully illustrated book which - in addition to very useful reference material - provides a wealth of diverse geologic data as evidence that mega thrust earthquakes of magnitude 8 or 9 in the Cascadia region may have generated major tsunamis along the Pacific Northwest and possibly elsewhere in the Pacific Ocean.

A section of the book summarizes and interprets the significance of extensive geological findings and purported paleotsunami deposits (sand layers covering peaty soils) found by geological investigations along the shores of northern California, Oregon, Washington and British Columbia, as evidence that tsunamigenic earthquakes have occurred throughout geologic time along the Cascade Subduction Zone. Based on the stratigraphic layering of the deposits, their extensive geographical distribution, and their dendrochronological and radiocarbon dating - as previously reported in the literature - the authors establish a relative chronology of at least three mega thrust events for the Cascadia region – the latest about 300 years ago (AD 1710 +/- 10 years). Lore of early natives pertaining to cataclysmic flooding and other unusual phenomena in the Pacific Northwest is provided as additional forensic evidence.

Subsequent sections of the book provide a comprehensive historical account of a destructive tsunami of unknown origin that struck Japan on January 26, 1700, and the results of a numerical modeling study of the tsunami, postulating the latest Cascadia mega thrust earthquake as its source - since it occurred around the same time.

Based on the dating of the ostensible paleotsunami deposits, the numerical tsunami simulation, the native accounts, and by a process of "elimination" - since no other great earthquakes occurred that year - the authors conclude that the missing parent source of "The Orphan Tsunami of 1700" observed in Japan (but nowhere else in the Pacific), must have been the megathrust earthquake in the Cascade region. To this earthquake an estimated moment magnitude range of 8.7 to 9.2 is assigned (which is almost as great as the December 26, 2004 tsunamigenic earthquake along the Great Sunda Trench), and a rupture zone of more than 1,000 Km (600 miles) – thus suggesting a continuous break of all fault segments along the entire length of the Cascadia subduction zone on the eastern side of both the Juan De Fuca and Gorda tectonic plates. Furthermore, based on the tsunami travel time to Japan as determined by the numerical simulation, the authors refine the radioactive carbon dating of the Cascade megathrust event as having occurred around 9 PM on January 26, 1700.

In summary, the book represents a dissection of the two disasters on opposite sides of the Pacific and is jam-packed with beautiful graphics and interesting views as to the Pacific Northwest's earthquake and tsunami vulnerability. However, no conclusive evidence is presented that moment magnitude 8 and 9 earthquakes can indeed occur along the Cascadia mega thrust, or that the earthquake of 1700 had such a high magnitude (8.7 to 9.2), or that it was indeed the source of the tsunami observed in Japan. Connecting the two events is an interesting scenario that is plausible, but the forensic geologic evidence on which it is based is largely circumstantial.

Although the book does not provide all the answers, nonetheless it is a valuable contribution that helps understand better the vulnerability of the Pacific Northwest and offers a strange sort of comfort in the knowledge that if a major or great earthquake occurs in the future, there will be additional vigilance and tsunami preparedness in the region. Thus, the purpose of the book to provide an overview of potential future risk factors for disaster assessment and mitigation is partially achieved. However, as the chosen title connotes, "The Orphan Tsunami of 1700" in Japan, may still remain a partial mystery, at least until additional geologic or tsunami run-up evidence elsewhere in the Pacific, ties it together conclusively to an earthquake in the Cascadia region.