Geological Records of Tsunami in the Southern Coast of Sri Lanka

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Studies based on 2004 Boxing Day Indian Ocean tsunami deposits of Sri Lanka, could contribute to interpret tsunami deposits elsewhere in the world geological record in much better way. Tsunamis leave behind layers of sediments that can be used to understand the waves which deposited them. By examining texture and the structure of the Tsunami deposits, we may be able to evaluate the wave height and flow velocity of the wave. Tsunami sediments may also contain markers which illustrate different sources (deep sea, terrestrial, estuarine, etc.) of sediments. Such records are important evidences to understand regions which may be at risk from a Tsunami.

In the present work, we have studied Tsunami sediment thickness, run-up, heights, inundation distance, and topographic profiles for 8 transects along the Tsunami affected south western coastal zones. Samples were collected (by open pit sampling) for laboratory analysis for grain size distribution, sedimentary structures, microfossils, mineralogy, and chemistry. Box cores were taken at several sites to study the stratigraphic details of the sediments. Sedimentary characteristics of the Tsunami deposits and underlying materials were logged and photographed. Erosion and flow-direction indicators were also documented. Residents were interviewed to obtain local conditions before and after the recent Tsunami.

Results show, that the 2004 Tsunami waves were capable of eroding the coastal region, up to 100 m inland. For example at Patanangla (South East of Sri Lanka) effect of erosion extends up to 75m inland and at a nearby location (Mahaseelawewa) it extends up to 100m. At Patanangala thickness of Tsunami sediments at 75m distance inland is 20 cm. The thickness decreases gradually inland. One cm thickness was found at 750 m distance, inland. Tsunami deposits show recognizable layering due to different Tsunami waves, incoming and out going waves and seiches. There were many laminations which could contribute to sedimentations occurred due to seiches between second and third waves. Parameters of 3 layering indicates three main Tsunami waves affected the Mahaseelawa area and the second wave has been identified as the biggest wave due to occurrence of thick coarse and poorly sorted sediments. Even the numerical modeling using the ComMit model also supports the same. Textural and structural data of sediments indicate that the third wave came after a considerable time lag. In between the second and third waves, there were many laminations which may have occurred because of seiches common during Tsunamis. In addition, results show that the mangrove forests have considerably decreased the wave energy (e.g. Yakghagala area in Western coat of Sri Lanka).

In the Sri Lankan history there is a record of major sea inundation in the coastal areas around the city of Colombo during the period of King Kelanithissa (approximately 2100 -2300 yrs B.P; resulted setting afloat his daughter, Princess Vihara Mahadevi into the sea to appease the gods). Extensive investigations of sediment cores collected from Lunawa, Dikwella, Karagan Lagoon (Hambanthota), Kirinda (altogether over 20 cores) do not show presence of paleotsunami sediments belongs to the period of 2100 -2300 yrs B.P. Thus, the particular event could be a local storm surge rather than a Tsunami.

Literature

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