SEDIMENTOLOGY AND MICROPALEONTOLOGY OF RECENT- AND PALEO-TSUNAMI SEDIMENTS OF SRI LANKA

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Tsunami waters started inundating many coastal regions of Sri Lanka at different times after the 2004 Sumatra-Andaman earthquake event. In the principal study area of Peraliya in the southern coastal region, maps indicating the extent of tsunami inundation were prepared using satellite imagery, field data and information provided by the villagers. After the inundation event, the sediments consisting of discontinuous sheets of differing thickness, heterogeneous compositions and diverse origins were found deposited on coastal depressions as well as in similar low lying inland locations. Most of these tsunami sediments are poorly sorted and contain heterogeneous mixtures of debris of buildings and vehicles, clothes, tree trunks, shells of organisms etc., derived from coastal and deep marine environments. However, there were fine grained tsunami sediments uncontaminated by terrestrial sources occurring as thinly laminated deposits believed and later confirmed to have been deposited from suspensions in temporarily stagnant tsunami waters in particular locations. These fine sediments had got deposited and found preserved in pre-existing topographical depressions, closed houses, containers, etc.

The different tsunami sediment types were mechanically separated according to size and grain size distribution curves were drawn. Finer fractions of the sediments were studied for their contents of different microfossils by reflection microscopy. The microfossils were thus separated out and selected samples were studied under the Scanning Electron Microscope (SEM). The cumulative curves for different types of tsunami sediments indicated close affinities. Microfossil contents of the sediment samples from different locations showed the presence of foraminifera, radiolarian and diatoms characteristic of the benthic and planktonic ocean environments. Influenced by references in the ancient

historical texts to the occurrences of tsunamis, some topographic depressions where recent tsunami sediments had got deposited were randomly earmarked for hand auger drilling. Some dug pits showed the occurrences of fine grained sediments similar to those from recent tsunami deposits. Grain size distribution curves and SEM studies on the sediments also showed cumulative curves comparable to those drawn for recent sediments. Microfossil contents also manifested remarkable similarities.

Carbon dating studies of the recent as well as paleo-tsunami sediments yielded anomalous and contradictory values. To receive a zero or very low age for the 2004 tsunami sediments from the absolute age determination techniques requires the presence of organic material (foraminifera, radiolarians, diatoms, etc.) transported onshore by the tsunami from the ocean. Given that the sediments settled by suspension contain a mixture of deep ocean microfossils that had been killed at different times, the result would be the average age of the sediment or the age of the particular microfossil that was subjected to radiocarbon dating. To overcome this issue it is required to choose the microfossils that had been killed after the tsunami event. But due to the microscopic size and considerable mixing of tsunami sediments with materials of different ages and the time elapsed from the tsunami event to the commencement of research studies, it is nearly impossible to select the microfossils with certainty about their deaths.