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Late Holocene Records of Storm Surge from the Gulf of Thailand

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The 2013 typhoon Haiyan hit the Philippines inspired the need for better understanding of tropical cyclone risk in Southeast Asia as well as around the world coastal community. Along the Thailand coastline, historical records highlight that the country has been experiencing large storm surges induced by typhoon, tropical storm, and the temporary strong northeast wind for many times in the past decades. We, therefore, has started our attention to explore relationships between past tropical cyclone cycles and the climate change with the aim of identifying and developing historical and pre-historical analogs. As a result from our survey along Thailand coastline, the recent storm surges mostly inundated as far as 400 m inland and left behind the deposition only between 100 to 200 m from the present shoreline. At many swales located inland beyond the inundated zone of the present day storm surge events, unusual sediment deposits by such a storm surge were found as multiple layers of sand sheets in between mud deposits. Here we show some examples of the multiple layers of storm sand sheets found at one site, Phanang Tak Bay, Chumphon, where a swale with the elevation 4.3 m higher than a mean sea-level is located between the relict strandlines. Strandline ridges here are aged at 1,970 $\pm$ 8 years ago and far between 800 - 1,000 m from the present shoreline. We made coring by gauge core along four transects perpendicular to the shoreline. We found that most of sand sheets show the continuity throughout the swale. With depth at 55 - 140 cm from swale surface, multiple layers of sand sheets were found intercalated with sharp contact between over and under burden muddy layers. Here at least fourteen layers of sand sheets were recognized. Each of sand sheets is characterized by fine- to medium-grained sand with abundant shell fragments. Thickness ranges from 1 to 22 cm. Normal grading was present at some layers and with average well- to moderately sorted. Lateral inland decreases in grain size and thickness of sand sheets are common. Shell fragments found in sand layers indicate clearly that they formed during the transportation process; whereas well-preserved and complete shape of several shells found in muddy layer indicate the in situ or living position of their deposition. These multiple sand sheets we discovered are of our pioneer results that were well documented as sedimentological analog for the future discovery of the pre-historical records. We, then, will pay more attention to describe the intensity and frequency of the storm surges for relating with the future climate change scenarios.