

Hydraulic experiment on the sedimentation and erosion by the tsunami wave

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Large tsunamis such as the 2004 Indian Ocean tsunami can remove sandy sediments from the sea bottom and beaches, and transport large amounts of sediments landward or seaward to form sandy tsunami deposits. Not only the field survey and numerical modeling, hydraulic experiment of the tsunami is also important to clarify the relationship between the hydraulic force of the tsunami and formation process of the tsunami deposit. Comparison between the field data of tsunami deposits and the results of the hydraulic experiment could be useful to understand the formation process of the tsunami deposits. Therefore, we conducted hydraulic experiment using one dimensional water tank and investigated the distribution of the tsunami deposit to clarify the relationship between the hydraulic force of the tsunami and sedimentation and erosion of the sediments. The length of the water tank is approximately 14 m and we placed a slope of 3 m in length with gradient of 1:10 at the end of the tank. The hydraulic force of the tsunami is possible to be adjusted by the amount of water in the water storage tank, and the tsunami is created by sudden release of the pneumatic gate. A tsunami wave runs up the slope, return to the water storage tank, and then dewatered from the drain gate. In order to investigate the influence of runup wave, we divided the sands on the slope and the bottom of the tank every 20 cm intervals using a sand trap equipment (Sugawara et al., 2003) when the tsunami wave reached at the top of the slope. We also divided the sands in similar way after the dewatering in order to investigate the influence of backwash. Then, we collected the sands from each interval in each case, and measured their dry weights. We used several different uniform sized sands in order to investigate the effect of grain size on the sedimentation and erosion by tsunamis. As a result, we found that the sands, especially in the case of fine sands, on the slope were extensively eroded by backwash and re deposited on the lower slope and the base of the tank.