Deposit-based assessment of tsunami size: example from Nankai-Trough earthquakes

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Researches on historical documents and geological records, such as tsunami deposits, have clarified the recurrence of the Nankai-Trough earthquakes and tsunamis during the past 6000 years. Magnitudes and source parameters of some historical tsunamigenic earthquakes, such as the 1707 Hoei and 1854 Ansei events, have been examined based on numerical modeling of coseismic crustal deformation and tsunami propagation and inundation. For example, the extent of the rupture area of the Hoei earthquake was revised based on the numerical modeling of tsunami inundation, considering tsunami heights from historical records and tsunami deposits in the Ryujin-ike pond in the eastern coast of Kyushu island (Furumura et al., 2011). The revised rupture area of the Hoei earthquake was extended to the Hyuga-nada, 70 km beyond the previously estimated rupture area.

The magnitude of the presumed largest (Mw=9.0) earthquake which may occur in the Nankai Trough (Disaster Management of Cabinet Office, 2012) is much greater than the size of known historical events. To validate the assumptions of the largest earthquake, information from tsunami deposits, which may record tsunamigenic earthquakes in longer time span, will play an important role. However, most tsunami deposits in the Nankai Trough region have been found from coastal lakes and narrow lowlands. In this region, spatial distribution of tsunami deposits cannot be a good indicator of tsunami inundation. Explorations are needed to correlate spatially-limited data of tsunami deposit with the magnitude information and source parameters of earthquake and tsunami.

In this presentation, deposit-based assessment of the size of earthquake and tsunami will be discussed based on numerical modeling of tsunami and sediment transport in the Ryujin-ike pond. Main interest of the research is that whether or not we can correlate the formation processes, distribution and thickness of tsunami deposit with the source parameters of the tsunami. In addition, results of the modeling will be compared with field observations of the deposits, to discuss the relationship with the historical earthquakes.

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References

Furumura, T., Imai, K., Maeda, T. (2011) A revised tsunami source model for the 1707 Hoei earthquake and simulation of tsunami inundation of Ryujin Lake, Kyushu, Japan. Journal of Geophysical Research,

116, B02308. doi:10.1029/2010JB007918

Disaster Management of Cabinet Office (2012). Investigative commission of great earthquakes in Nankai Trough. http://www.bousai.go.jp/jishin/nankai/model/index.html (Retrieved on Feb. 17, 2019)

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