

On the well-water and sea-level changes witnessed before the past Nankai Earthquakes

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The Nankai Earthquakes occur on the boundary between the Eurasia Plate and the Philippine Sea Plate. Since 684A.D, the earthquakes occurred twelve times at the same place. The last Nankai earthquake occurred in December 1946. The water level of many wells along the Pacific coast, from the Kii Peninsula to Shikoku, showed remarkable decreases a few days to several hours before the mainshock of the 1946 Nankai Earthquake (Figure 1). Also, abnormal changes in sea level were witnessed since several days before the mainshock (Figure 2). Moreover, from several hours before the mainshock, fishing boats returning home could not reach the wharf because the sea level was too low.

If pre-slip occurs on the deeper portion or extension of the earthquake fault, uplift is expected to occur over the area of the decreased well water. However, the expected uplift is only a few centimeters. Can such minor uplift explain the witnessed drastic changes of the well-water level? Umeda *et al.* [2010] have shown, in deltas with little freshwater supply, well water can decrease drastically by a small amount of uplift. Indeed, many of the wells exhibiting a drastic drop of water level were located in small deltas with little freshwater supply. The decrease of the well water before a great earthquake was also witnessed shortly before the 1854 Nankai Earthquake (M8.4). If our leverage model of the water level drop is correct, it means that the preslip occurred before the two latest Nankai Earthquakes. These understandings are crucial for the prediction of the next Nankai Earthquake.

Reference

Umeda, Y., K. Shigetomi, K. Onoue, T. Asada, Y. Hosono, K. Kondo, M. Hashimoto, S. Kimura, K. Kawatani, and M. Omura [2010], On the Well Water Decreases Preceded the Nankai Earthquake –For the Prediction of Next Nankai Earthquake-, *Zisin 2*, **63**, 1-10.

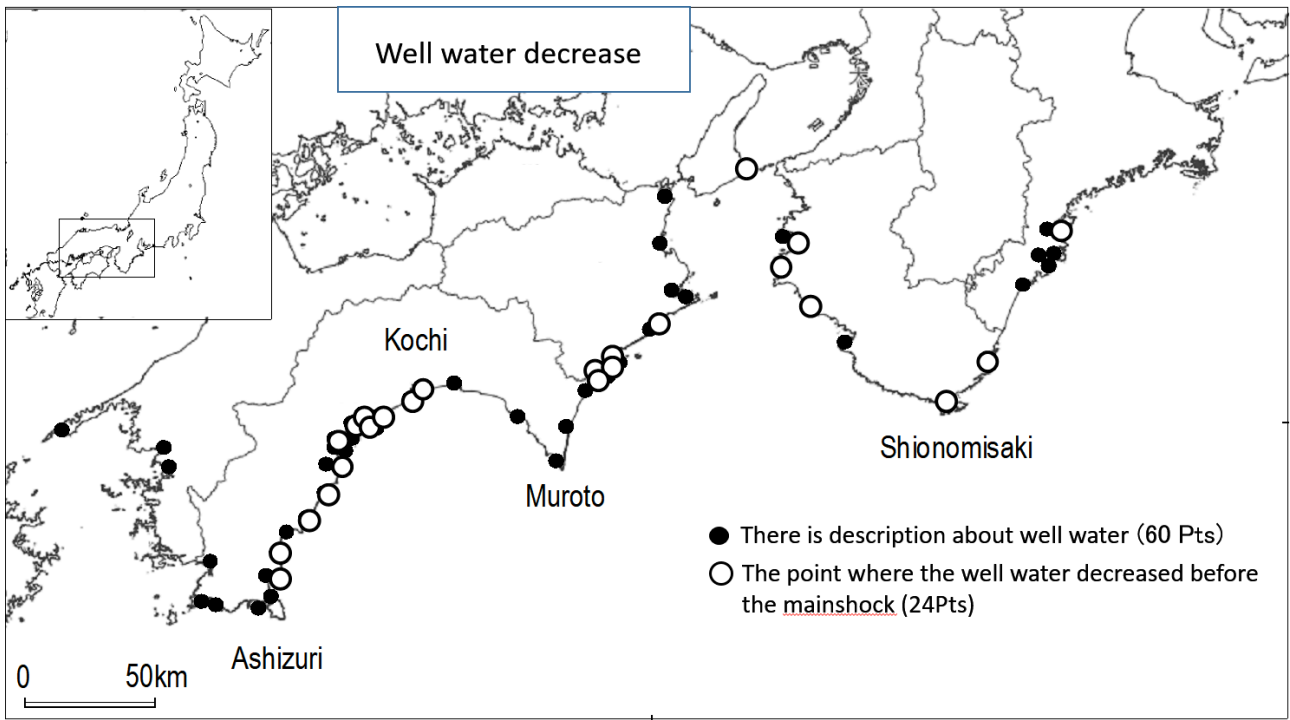


Figure 1. Wells where the drastic drop of the water level or complete depletion was observed before the 1946 Nankai Earthquake.

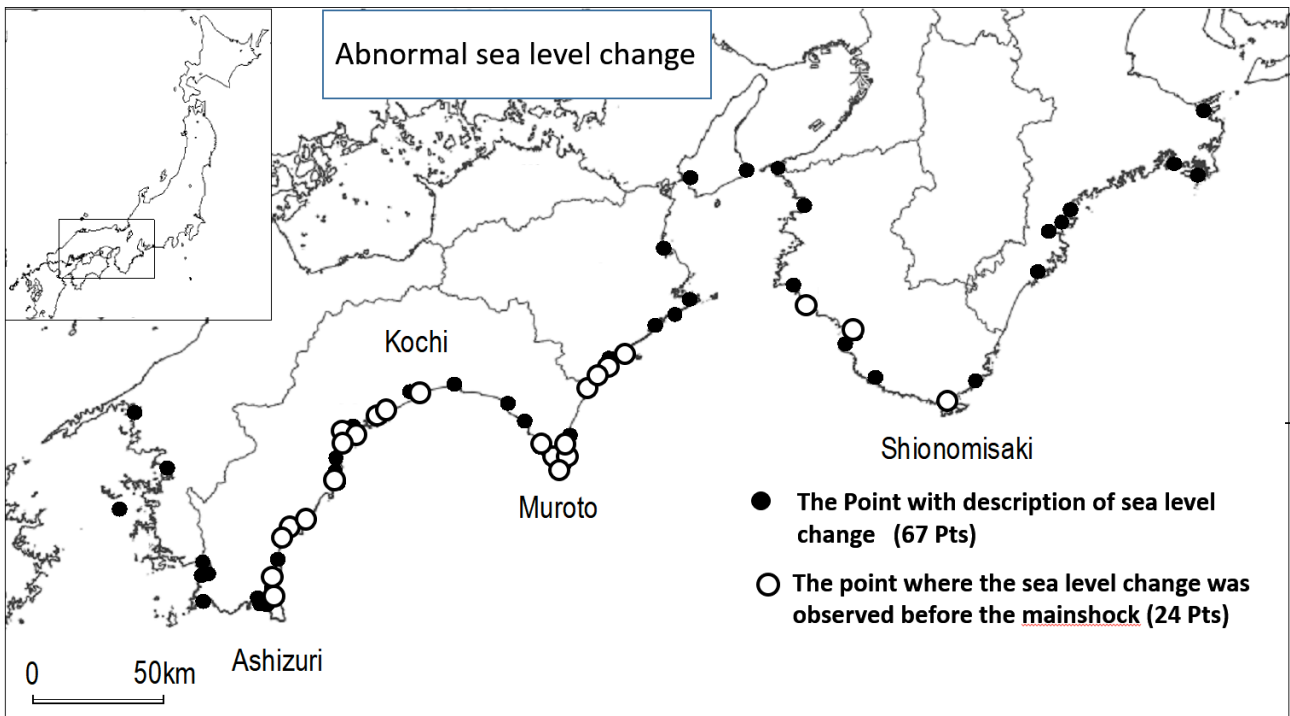


Figure 2. The locations where abnormal sea level changes were observed before the 1946 Nankai earthquake.