On the sea level changes before the 1946 Nankai earthquake on the Pacific coast of Shikoku, Japan

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1. Introduction

The abnormal sea level changes before the 1946 Nankai earthquake (M8.0) were witnessed by the inhabitants, on the Pacific coast of Shikoku, Japan. From a few days before the main shock, irregular tides were witnessed. The fishing boats could not arrive at the ports, because of the low sea level. On the contrary, some boats could arrive at ports. We considered that the abnormal sea level changes were caused by the small tsunamis from a few days before the main shock. The period and amplitude of the small tsunamis seem to have been larger and shorter closer to main shock.

2. Period and amplitude of the sea level changes

At seven points in the Susaki bay, the sea level changes were observed from
2010 to 2011. The height of tsunami by the 2011 off the Pacific coast Tohoku earthquake was amplified 20 and 8 times compared to that of the Nankai trough of 2300m depth (JAMSTEC) and 100m depth, respectively. The periods of 30-40, 50 and 80 minutes of sea level changes were observed in either case of tsunami, storm or mild weather. The periods of 50 and 80 minutes would be characteristic periods of Tosa bay. We considered that the small tsunamis were generated in the Tosa bay before the 1946 Nankai earthquake.

3. Assumed sea level changes

The assumed sea level changes(f(t)) before the main shock were obtained by the summation of the sea level changes by long term crustal movements(Fl(t)), small tsunami(F0(t)) with the period of 50-80 minutes and astronomical tide(Ft(t)). That is, f(t) = Fl(t) + F0(t) + Ft(t). Fl(t) = a • ln(t) + D0 was adopted by Umeda and Itaba(2013). In view of the summaries by the testimony for the abnormal sea level changes, F0(t) was assumed as F0(t)= A • B(t)m[cos$\{\omega$ln(t-tc) $+\phi\}$]. ω and ϕ is frequency and phase angle, respectively. A is the amplitude ratio at each fishing port when the amplitude of Susaki bay is 1.0. Assumed sea level f(t) is shown by solid line in figure. f(t) of Susaki bay is expressed well the witness testimonies, but that of Muroto is not expressed them. f(t) of Muroto will be improved by considering the short -term and small-scale crustal deformations just before the main shock in the Muroto region.

Keywords: 1946 Nankai earthquake, sea level change, witness testimony,
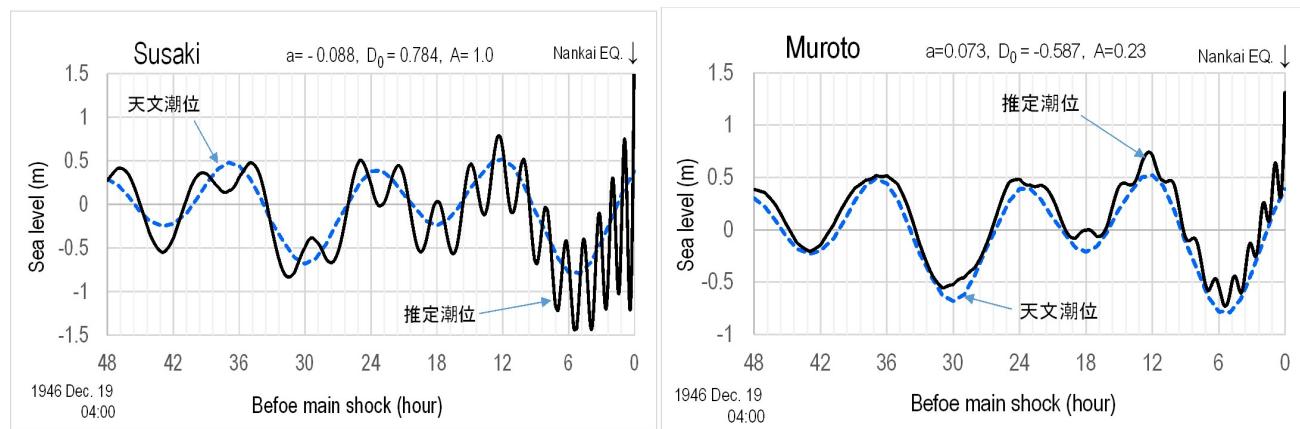
1946年南海地震の前に小規模な津波が発生していたとして，各地で推定される海水位の変化（黒の実線）と比較のための天文潮位（青の点線）