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Re-examination of the original questionnaire documents for the 1944 Tonankai, 1945 Mikawa, and 1946 Nanaki earthquakes

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With the object of estimating seismic intensity, the Earthquakes Research Institute (ERI) of the University of Tokyo performed questionnaire surveys for the significant (destructive or large/great) earthquakes from 1943 to 1988 (Kayano, 1990, BERI). In these surveys, Kawasumi (1943)'s 12-class seismic intensity scale similar to the Modified Mercalli scale (MM-scale) was used. Survey results for earthquakes after 1950 were well investigated and published (e.g. Kayano and Komaki, 1977, BERI; Kayano and Sato, 1975, BERI), but the survey results for earthquakes in the 1940s have not been published and original documents of the surveys was missing. Recently, the original sheets of the surveys for the five earthquakes in the 1940s with more than 1,000 casualties were discovered in the ERI warehouse, although they are incomplete (Tsumura et al, 2010). They are from the 1943 Tottori (M 7.2), 1944 Tonankai (M 7.9), 1945 Mikawa (M 6.8), 1946 Nankai (M 8.0), and 1948 Fukui (M 7.1) earthquakes.

In this study, we examined original questionnaire and summary sheets for the 1944 Tonankai, 1945 Mikawa, and 1946 Nanaki earthquakes, and estimated the distributions of seismic intensity, various kinds of damage, and human behaviors in detail. Numbers of the survey points for the 1944, 1945, and 1946 event are 287, 145, and 1,014, respectively. The numbers for the 1944 and 1945 earthquakes are much fewer than that of the 1946 event, because they occurred during the last years of World War II.

The 1944 seismic intensities in the prefectures near the source region (Aichi, Mie, Shizuoka, and Gifu Pref.) tend to be high. However, the 1944 intensities are also high and damage is serious at the Suwa Lake shore in Nagano Pref. which is about 240 km far from the source region because seismic waves are amplified dramatically in the thick sediment in the Suwa Basin. Seismic intensities of the 1945 Mikawa earthquake near the source region in Aichi Pref. were very high (X-XI). However, the intensities rapidly decrease with the epicenter distance, and show relatively low numbers (IV-VI) outside Aichi Pref. because the 1945 earthquake was a shallow crust earthquake with moderate size (M 6.8). The maximum seismic intensity of the 1946 Nankai earthquake estimated from the damage of Japanese-style wooden houses reach X-XI near the source-rupture area such as in Shikoku Island and Wakayama and Okayama Prefectures. The damage of wooden houses was more serious in the plains and basins of populated cities than that in the mountainous regions. The estimated seismic intensities from other damage (bridges, stone walls, underground pipes, etc.) also exceed X.

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