

1847年善光寺地震の余震系列：4史料にある時間減衰と大森・宇津公式の最適パラメータ値

Aftershock sequence of the 1847 Zenkoji earthquake: Temporal decay presented in four historical materials and best fit values of parameters for Omori-Utsu law

*服部 健太郎¹、中西 一郎¹

*Kentaro Hattori¹, Ichiro Nakanishi¹

1. 京都大学

1. Kyoto Univ.

Seismic intensities estimated from damage caused by earthquakes have been most commonly used to locate earthquake epicentral area since Irish seismologist Mallet used degree of damage by the great Napoli earthquake of 1857 to locate earthquake source area. However, the scales of seismic intensity are different among countries. The seismic intensities are somewhat subjective and are affected by ground conditions.

Matsui and Oike (1997) proposed the use of the numbers of felt aftershocks right after large historical earthquakes to locate source area. A problem in their approach is that it is usually difficult to count the number of aftershocks in epicentral area or places close to the area.

We attempt to fit Omori-Utsu law (Utsu, 1961) to aftershock sequences of a historical large earthquake to overcome the above mentioned problem of the location of epicentral area. The value from counting aftershocks is integer, and seems to be more robust than the estimation of ground motion from the description in historical materials. The temporal decay of the number of aftershocks $n(t)$ is described by the empirical Omori-Utsu law as $n(t) = K(t+c)^{-p}$, where t is the lapse time after the mainshock, p is an exponent showing the decay rate, c is a time scale, and K is a parameter showing aftershock activity.

We use aftershock sequence data of the 1847 Zenkoji earthquake presented in four historical materials owned in Matsushiro, Suwa, Fujinomiya, Gifu, in order of the distance from the epicentral area. We assume $c=0.1$ and p is common in four data, and obtain the best fitting p and four K . The result is shown in Fig.1. In the figure, it is clear that Omori-Utsu law does not fit the time range right after the earthquake occurrence for Matsushiro, Gifu, Suwa data, but fits Fujinomiya data. Another clear feature in Fig.1 is that the parameter K for Gifu data is 300. This value is much larger than those for Suwa ($K=80$) and Fujinomiya ($K=6$), both places are located closer to epicentral area than Gifu. Fig.1 may suggest that the data preserved in Gifu were not written in Gifu, but in a place much closer to epicentral area.

キーワード：1847年善光寺地震、余震系列、大森・宇津公式

Keywords: the 1847 Zenkoji earthquake, aftershock sequence, Omori-Utsu law

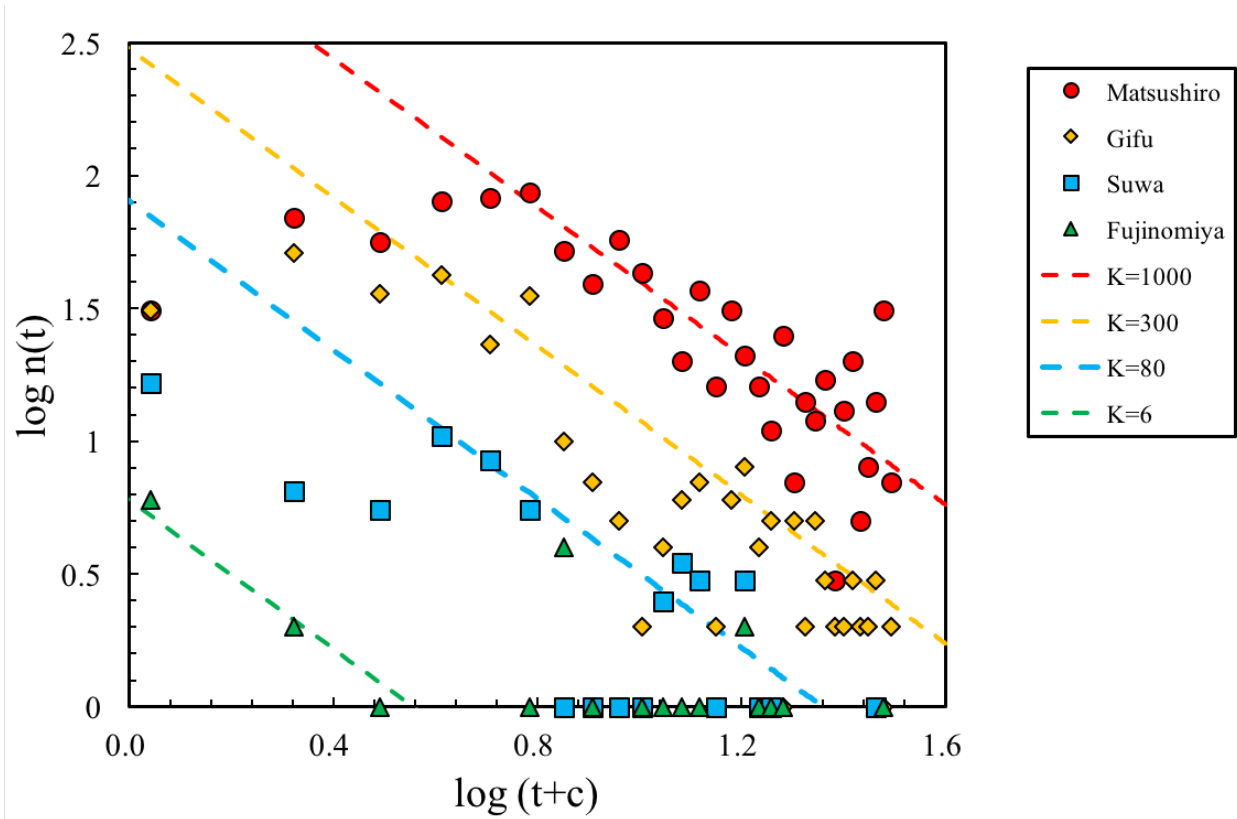


Fig. 1 Temporal decay of the aftershocks of the 1847 Zenkoji earthquake with lines ($p=1.4$) from Omori-Utsu law (Utsu, 1961)