

Comparison of Seismic Waveforms Detected at Different Regions

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I. Introduction

Generally, it is said that there is a relationship between distance from the observation point to the epicenter and the duration of preliminary tremors in an earthquake. The formula that expresses that the relationship is the Omori's formula. This is written $D=kt$. Where, D is the distance from the observation point to epicenter, t is duration of preliminary tremors, and k is the factor of proportionality. However, it is not well known that the number k in the formula (Omori constant) does not have a number. For example, each textbook for middle and high school gives it a different value.

II. The aim of this research

Last year, we made a hypothesis and proved it by research. The hypothesis was that Omori constant is different in each region. In this year, we also researched it and the cause of the difference among the Omori constant in each region.

III. Method

(1) The dates of waves in earthquakes (2014/10/01~2016/12/31) were downloaded from the High Sensitivity Seismograph Network Japan(Hi-net). All the dates were the event's waves dates on Hi-net and observed at Kanto, Kinki, Kyusyu region. The hypocentral depth of the earthquakes on those dates was lower than 150 km and the magnitude was not stipulated.

(2) The dates from Hi-net were analyzed with software to analyze the earthquake waves, "win system" (made by Professor Akihiko ITOH at Utsunomiya university). The earthquake is observed at each observatory. Therefore several earthquake waves are observed in one earthquake. The earthquake waves were arranged in order of their hypocentral depth by the win system. In this way, picture dates were made by the win system. We printed these on paper, gained numbers of the distance from the observation point to the epicenter and the duration of preliminary tremors in earthquake with pen and ruler from the earthquake waves on these papers. We drew a line between the points the P-waves seemed to reach and the S-waves seemed to reach and measured the length between them and the length between each observation point and the epicenter on paper with a ruler. The vertical axis of the graph of the earthquake wave is the time and the horizontal axis is the distance from the epicenter. The distance and duration of the preliminary tremors were calculated by converting the numbers measured on paper into the real distance and time.

(3) The Omori constant was calculated by substituting the distance from the epicenter and, the duration of preliminary tremors for Omori's formula.

(4) We calculated an average of the Omori constant at each region and, compared them. In addition, we researched the relationship between the hypocentral depth and the value of k to clarify the cause influencing the Omori constant.

IV. Results and Discussion

(1) The averages of the Omori constant in each region are 8.95 in Kanto, 8.63 in Kinki, and 8.27 in Kyusyu. Direct to each Omori constant in each region, there are ranges of the number though a bit different for each region. That results mean there is no particular value for the Omori constant in each region.

(2) We noticed the relationship between the hypocentral depth and the value of k in the same way last year. Last year, we concluded there is little relationship between them because number of earthquake wave dates were low. However, we proved there was no relationship between the Omori constant and the hypocentral depth there.

V. Conclusions

The Omori constant in Kanto which we have is higher than that of other regions and there is no relationship between the hypocentral depth and the value of k . It can be said that the cause of the value of k being different in each region is ground. We will research the relationship between the value of k and the ground later.

Keywords: earthquake, Omori's formula

