

Difference of availability between the F-net and the Hi-net seismograph networks before the 2011 Tohoku earthquake

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1. Introduction

It was reported that number of missing waveform images of the F-net, the broadband seismograph network of NIED, increased before the subject earthquake (Sue, 2013).

With the aid of a document of the Headquarters for Earthquake Research Promotion, where availability of the F-net and the Hi-net, high sensitivity seismograph network are shown, we do further investigation.

2. Investigation results

Fig.1 shows availability of the F-net and the Hi-net from April 2009 to March 2012. It shows the following phenomena.

- During the period of longer than 1.5 years from April 2009 to November 2010, availability of the F-net was close to 100%, though it became worse a little several times.
- Starting from December 2010, it became worse continuously, and it took minimum value in January 2011.
- Then it recovered, but it was worse than normal value.
- From February 2011, availability became worse again, and it took minimum value again.
- Then it recovered, though it was worse than normal values, and the 3.11 earthquake occurred.
- It returned to normal state in May 2011.
- Availability of the Hi-net was almost constant, except for the days and one month after of the earthquake.

3. Issues

The following points to be discussed.

- For the duration of longer than 1.5 years, high availability of the F-net has been achieved. Why did it become worse starting from around 3 months before the 3.11 earthquake?
- Why did availability vary up and down during the worse period?
- Why was there difference in stability between the F-net and the Hi-net at the 3.11 earthquake?

4. Discussion

For several months before the earthquake of magnitude = 9.0, it is believed that the F-net seismographs had been affected in some way by the crust at their locations. Difference in stability between the F-net and the Hi-net could be because of difference in natural period of the seismographs. Natural period of the F-net seismograph is 360 seconds (STS-1 type) and 120 seconds (STS-2 type), whereas that of the Hi-net is 1 seconds. There were some sort of movements before the earthquake, which were relatively slow. Thus only the F-net seismographs were affected.

The major cause for long-lasting trouble of the F-net is "electric power supply trouble" according to the official information of the F-net.

Gratitude: We thank NIED for the use of data for the F-net and the Hi-net.

References:

Yoshiki Sue, 2013, The increase in missing waveform images of the F-net broadband seismograph network preceding the 2011 Tohoku earthquake, JpGU2013 SSS30 P01.

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