

Long-term variation in the propagation property near Nojima Fault, Awaji island

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Introduction

The experiment with ACROSS system in Awaji has long been suspended due to malfunction of the vibrator after the two experiments, from 2000 to 2001 (Ikuta et al. 2002, Ikuta and Yamaoka 2004) and from March to June 2003. The malfunction was due to the breakage of the bearings in the vibrator.

In 2007, we have repaired the vibrator and resumed the long-term measurement of propagation property of seismic velocity from November 2007. In this experiment we try to estimate the change in the propagation property between the 2000-2001, 2003 and 2007-2008 experiments. As the operation parameters are different between the 2000-2001 and the 2003 experiment, we use both operation parameters for the 2007-2008 experiment to make a comparison among the experiments in different parameters.

In the 2007-2008 experiment we have made a one-month operation for each parameter due to some unexpected trouble in experiment instruments. After two-more one-month operation, we will make a correction for the temporal change in the near-field property to make more precise comparison.

Repairment

After two-year non-operation period, we started to operate the ACROSS source in July of 2005. In the experiment the lubrication oil in the high-frequency (HF) unit that can be operated up to 35Hz became milky due to water intrusion into the vibrator. Although we change the lubrication oil completely, the HF unit stopped due to unusual vibration in the vibrator. The inspection by specialist shows that the unusual vibration was due to the breakage of the bearing in the vibrator.

The HF unit was disassembled in a shop to find that the bearing in the lowermost part of the vibrator was broken, showing that the main cause was the intrusion of water. We also found a small hole in the side of the body of the vibrator. Water may intruded into the vibrator due to poor sealing of the hole.

As we cannot get the same bearing that is specifically engineered on a standard model, we need to scrape the outer side of the inner ring of the standard bearing unit. This makes the gap between outer and inner unit of the bearing from 100 micron to 160 micron, otherwise the life of the bearing will be very short.

Experiment

The experiment is designed to be able to estimate the temporal change from the 2000-2001 experiment until now. The operation parameter in the 2000-2001 experiment and the 2003 experiment is different. In the 2000-2001 experiment the modulation period was 5 second, whereas that of the 2003 experiment was 20 seconds with the same modulation width and central frequency. In order to compare the two experiment we make two kinds of one-month-long experiments, each of which the vibrator was operated with the same parameter of either the 2000-2001 or the 2003 experiment.

The operation parameters we used are as follows,

1) Duration: November 14 to December 7, 2007.

LF unit: 13.0Hz for central frequency, 2.1Hz for modulation width and 20 seconds for modulation period.

HF unit: 19.1Hz for central frequency, 2.1Hz for modulation width and 20 seconds for modulation period.

2) Duration: December, 2007 to January 18, 2008.

LF unit: 13.0Hz for central frequency, 2.1Hz for modulation width and 5 seconds for modulation period.

HF unit: 19.1Hz for central frequency, 2.1Hz for modulation width and 5 seconds for modulation period.

The preliminary analysis shows the systematic temporal change from 2000 to 2007. The travel time decreases by 2 milliseconds and amplitude increases by 30% for 7 years. To make sure the systematic change and get more precise pattern of variation we need to correct the data using the data that are measured near the vibrator.