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Research Project on Seismic Activity of Nagaoka-seien-fault zone (Western margin of fault zone of Nagaoka Plain)

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Introduction

In recent years, there has been a series of large earthquakes occurring in the high strain rate zone at eastern margin of Japan Sea, and a great deal of interest is being expressed not only by specialists, but by the general public, in subjects such as the relationship between active tectonics and earthquake faults, source mechanisms, and ground amplification characteristics. Although a range of investigations have already focused on the western margin of the fault zone of the Nagaoka plain, located in the high strain rate zone at eastern margin of Japan Sea, its activity characteristics, including the possibility of a link with fault activity, have not necessarily been explicated. Accordingly, the Association for the Development of Earthquake Prediction (ADEP), determined to newly construct a high-density seismic observation network in the region in question, as a part of its investigation and research into seismic activity in the Nagaoka-seien-fault zone. An outline of the observation network is presented here.

Outline of observation network

The observation network consists of 40 stations deployed in a pattern that surrounds the region. 9 of the 40 stations were constructed in 2009 and the other 31 are under construction in 2010 (see Figure 1). The space interval between each seismic station is about 5 ~ 10 km. Furthermore, to investigate the relationship between tectonics, faults and seismic activity in the region, a continuous GPS observation network will also be conducted at 20 of the 40 stations.

At each seismic observation point, in order to respond to activity ranging from microearthquakes to large earthquakes, 3-component velocity seismometers (Lennartz electronic GmbH, LE-3D) and Servo type accelerometer (Japan Aviation Electronics Industry, JA-40GA) are combined to create a new high dynamic range broadband borehole seismograph. To achieve stable high sensitivity seismic observation avoiding surface ground noise, seismograph is installed at the bottom of a borehole roughly 100 m in depth. An accelerometer is also installed at ground surface, and together they provide the combined properties of the Hi-net and KiK-net. The data from the seismic stations will be transmitted to the ADEP data center in 1 second packets (Figure 2).

It is planned for this data to be combined with data from pre-existing seismic networks operated by various institutions and subjected to carrying out a series of data processing such as event detection, determination of hypocenter and seismic intensity and focal mechanism. The data obtained is also planned to be transmitted to the seismic observation network of universities nationwide, via the Earthquake Research Institute, University of Tokyo.

The GPS data, on the other hand, will be sent from each station to Nagoya University, then combined

with the data from surrounding GPS stations and analyzed.

Future plans

The period of observation is currently expected to be at least 10 years, and it is planned during that time to conduct various survey and research such as P and S wave velocity structure research. It is anticipated that useful data will be obtained regarding detailed velocity and attenuation structures in the area surrounding the seismic observation network, as well as microearthquake activity in the fault zones and tectonic zones.

Moreover, it is planned during the next fiscal year to carry out seismic reflection survey including Vibroseis along the western margin of the fault zone of the Nagaoka plain (a length of approximately 70 km), and combined with the results of past investigations, obtain vital data allowing, for example, improvement of the accuracy of hypocenter determination.

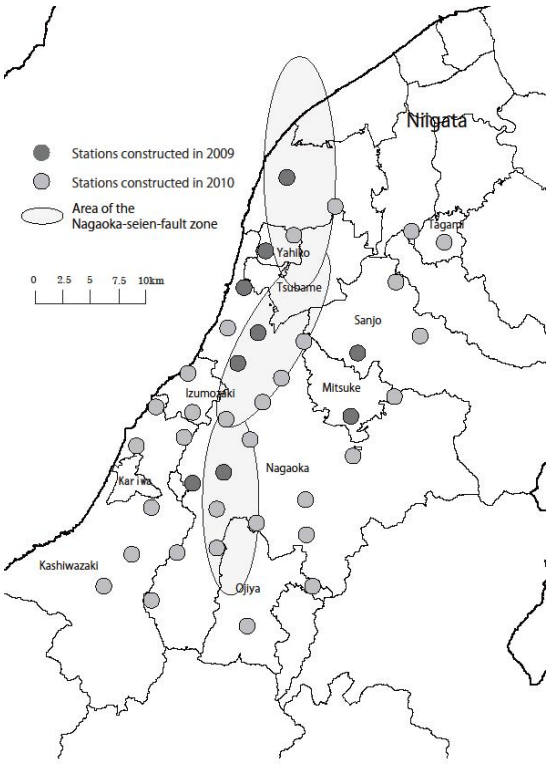

Figure 1. Arrangement of observation points

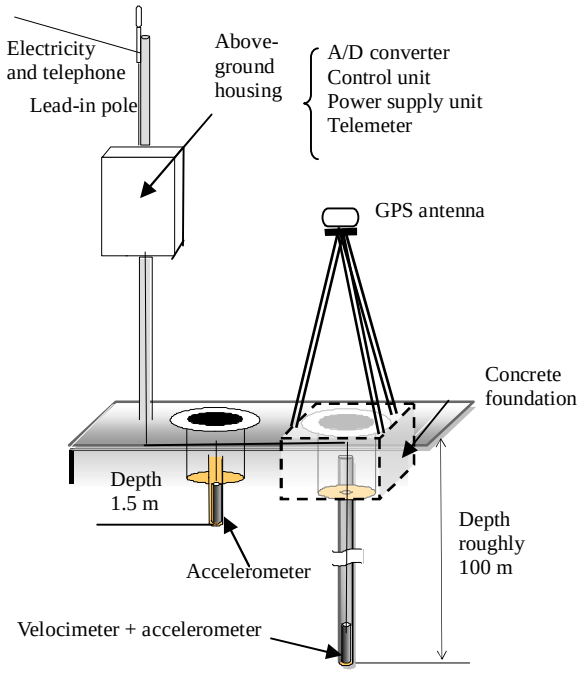

Figure 2. Observation point equipment configuration (schematic diagram)