Geoslicer survey at faults caused Zenkoji earthquake (1847) in Nagano basin, central Japan

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1. Introduction

There are reverse faults at western margin of Nagano basin. Zenkoji earthquake struck this region at 1847. Using maps of injury, Usami (1996) says that surface was ruptured as long as 40km by the earthquake and that the earthquake magnitude was 7.4. In ancient writings, there are some records of the crustal movement in Nagano city at the time of the earthquake. By the way, we could find some tectonic scarps in alluvial plains in Nagano basin by careful reading of aerial photographs. In such places, we could expect to get the information about the latest event.

Our study area is Toyono-cho Asano, where the Torii River joins the Chikuma River. It is located at the middle of faults in Nagano basin. In the area, the alluvial fan of the Torii River gets into the alluvial plain of the Chikuma River. In the alluvial plain, we could find tectonic scarps. Setting our study line (300m) crossing scarps, we excavated at 3 points along the line using geoslicers (4m) to take samples for the chronological measurement. Moreover we surveyed the depth of the gravel stratum that composes the alluvial plain at 7points along the line using borings. As a result, we could get the information about the distribution map of active faults and about the amount of the vertical displacement at the time of Zenkoji earthquake.

2. Results and Considerations

The amount of the displacement of the scarp was about 1.5m by the surface survey. At southeast and northwest sides of the scarp, we could find a little (0.5m) uneven surface that was probably artificial. Gravels that compose the alluvial plain were pebble gravels (diameter 3cm) supplied by the Chikuma River. The top of the gravel stratum was differed at a little north site of the scarp, and the amount of the displacement was about 1.4m. There are flood plain deposits on the gravel stratum, and its thicknesses were not differed at both side of the scarp. So the scarp is not erosive one but tectonic one. Moreover we can say that the surface and the gravel stratum were displaced the same times because the amounts of the displacement are almost equal.

The chronology of the gravel stratum was about 200yr.B.P. The event that made the vertical displacement (1.5m) is thought to be Zenkoji earthquake (1847), because there are not any records as large as caused the displacement from 1847 to the present. The amount of the vertical displacement (1.5m) has a good balance with ancient writings that say it is from 0.9m to 2.5m.

At Nakano-city Angenji and Kijimadaira-cho Hotaka, we can find tectonic scarps in alluvial plains, so we are going to research in the same way.