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# Seismic velocity structure between the Nobi earthquake fault system and the Fukui earthquake fault system

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1. Introduction

The 1891 Nobi earthquake is the largest inland earthquake in Japan. A lot of active fault segments run parallel or oblique mutually in NW-SE direction around the source area, and some of them were simultaneously ruptured in 80 km at the event. Since seismicity of the source area is still relatively high, we chose as a case study site to detect important factors of simultaneous rupture. We have carried out morphological, geological and geophysical surveys around the step-over between the two ruptured fault segments, Nukumi fault and Neodani fault since 2009. In this meeting, we present velocity structure around the boundary area of the Nobi earthquake fault system and the Fukui earthquake fault system based on the micro-earthquake observations performed in 2009 and 2010.

2. Seismic observation

In the first year, 26 temporal seismic stations were deployed around the Nukumi faults and half the north of the Neodani fault from June to November, 2009. In the second year, also 26 stations were deployed around the boundary area of the Nukumi fault and the Fukui earthquake fault system from May to November, 2010. Three dimensional velocity sensor LE-3Dlite and off-line recorder DAT-4 were settled at every station. The input data are continuously recorded at sampling frequency of 200Hz.

3. Tomographic inversion

In order to clear subsurface structure around the active faults, we carried out a tomographic inversion analysis using tomoDD. First, local earthquakes were manually picked from the continuous record and their hypocenters were located provisionally using a P wave velocity structural model of two horizontal layers (5.5km/s to 0-3km, and 6.0km/s to 3km-). Picking information at some surrounding permanent stations of JMA, NIED, and universities was also used in the analysis. Second, arrival time data of the 550 local earthquakes and 8 dynamite shots, and the other download picking information of 440 local earthquakes by permanent stations are used in the tomographic analysis. The absolute arrival times used in the tomography were about 25,000 for both P and S waves . The differential arrival times reaches about 90,000 for both P and S waves.

4. Velocity structure around the active faults

Low velocity zone are remarkable between the Nukumi fault and Ibigawa fault at the shallow part (z=0,3km). In contrast high velocity zones are found at both outsides of it. The high velocity zones are apart from each other about 10km at the surface, but they are closing at the deeper part (z=6,9km). As a result, the low velocity zone between them shows a prism body. Northern part of the Neodani fault and the Kurotsu fault which was ruptured in 1891 lies in the prism. Two outer faults may form a flower structure and a new fault is created in the center. The facts indicate that fault rupture is easy to propagate from the extension to a fault segment which is put in the low velocity zone between two parallel faults.

In contrast, E-W velocity bands are found around the boundary area of the Fukui earthquake fault system and the Nobi earthquake fault system at the deeper part (z=6,9km). High and low velocity zones are repeatedly appeared every 5 km in the band. This strike and distance is similar to the active faults over them. Although there seems to be a seismic zone from the Fukui earthquake fault system to the Nobi earthquake fault system, the result indicates the existence of subsurface geological structure across the zone.

Keywords: the 1891 Nobi earthquake, the 1948 Fukui earthquake, Seismic velocity structure, Active fault