

Seismic profiling of the offshore extension area of the Yanagase-Sekigahara Fault Zone

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We have conducted seismic reflection profiling on the offshore extension of the Yanagase-Sekigahara Fault Zone, as part of the FY 2012 MEXT survey project on active faults in the coastal zone. The survey area is about 35 km long in the N-S direction, from Matsudashi Bank about 20 km off Tojinbo, to 10 km north of the Echizen Cape.

Survey lines were located in the E-W direction at 2 to 3 km intervals along the tracks of a submarine active fault survey conducted by Japan Coast Guard in FY 2003. We carried out 16-channel seismic reflection profiling using a 200-J boomer source. The total survey track length is about 222 km.

Although the northern termination of the Yanagase-Sekigahara Fault Zone was located at the northern tip of the onshore Ayukawa Fault, the present seismic profiling has revealed an evident east-side-up active fault, 1 to 1.5 km off, and running parallel to the Echizen Coast. It has also proved that the fault connects to N-S trending faults off Fukui Port, which were revealed by Japan Coast Guard (2004) and Japan Atomic Company (2008). Further, the present profiling has made clear that the westernmost fault off the port traverses the continental shelf toward NNW and reaches to the western side of an N-S-striking anticline, which was revealed by JCG (2004) and is situated to the southeast of Matsudashi Bank.

Off the Echizen Coast the fault looks like a reverse fault because it is accompanied by a west-side-up back thrust, whereas the predominance of a strike-slip component is inferred for the NNW-striking portion off Fukui Port from lack of anticline and back thrust.

The Yanagase-Sekigahara Fault Zone extends northwards to the area where it meets with the NE-SW-trending Echizen Bank Chain. The northern termination of the fault zone inferred from the seismic profiling is about 29 km north of that by the Earthquake Research Committee (2004).

On the profile off Mera on the northern Echizen Coast, cumulative fault displacement is recognized in postglacial transgression deposits, and the displacement reaches up to the deposits after the maximum sea flooding. Therefore, it is inferred, for the offshore extension of the Yanagase-Sekigahara Fault Zone, that the most recent reactivation occurred in the past 6 thousand years (after the climax of the Jomon Transgression).

In addition, we have ascertained the existence of NNW-SSE- to NW-SE-striking normal faults on both sides of the Echizen Bank Chain, as already indicated by JCG (2004). The longest normal fault is traceable for about 11 km, and the gentlest one dips about 50 degrees on the profiles (down to 100 m in depth). Some faults show horst-and-graben structures as well as V-shaped or minor graben-like depressions of reflection surfaces, which are generally seen on strike-slip faults. The normal faults may be active even in the Holocene because their displacements reach to the sea bottom.

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