

HDS029-01

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Geologic structure and rupture history of the south extension of the Kuromatsunai-Teichi Fault Zone by sonic survey

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INTRODUCTION

The Kuromatsunai-Teichi Fault Zone, meridionally traversing the basal part of Oshima Peninsula in south Hokkaido, reaches the northwestern coast of Uchiura Bay on the Pacific side. Along the coast, there are late Pleistocene marine terraces that are cumulatively tilting landwards. The landward tilting of the marine terraces suggests tectonic deformation due to offshore active faulting or folding. However, we have no precise geologic information on offshore active fault and fold. Under the circumstances, Active Fault and Earthquake Research Center, AIST and Geological Survey of Hokkaido, HRO have carried out a comprehensive survey of the northwestern coastal area of Uchiura Bay, as a part of the 2010 offshore active fault survey project funded by MEXT. The survey comprises high-resolution single and multichannel sonic surveys, ultra-high-resolution single-channel sonic survey and paleoseismological piston coring. In this presentation, we focus on the major results from the high-resolution single and multichannel sonic surveys using boomer source.

SONIC SURVEY LINES

Fig. 1 shows present survey lines. In Uchiura Bay, 5 to 6-km-wide scallop nurseries are densely disposed along the coast. Therefore, survey line deployment is restricted to 1) 1 to 2-km-wide narrow littoral zone in back of the scallop nurseries, 2) 5 to 6-km-long passages across the nursery zone, and 3) offshore area outside the nurseries. We conducted single channel profiling for survey lines within the scallop nursery zone and multichannel sonic prospecting for the offshore survey lines outside the nursery zone.

MAJOR RESULTS

1) Discovery of active anticlines

We have found two left-stepping anticlines with a 5 km interval near the coast of Oshamambe and off Kunnui, respectively. The anticline off Kunnui clearly upheaves the postglacial transgressive surface (Fig. 3), and is identified as an active fold. The anticline near Oshamambe is also judged to be an active fold on the basis of structural concordance with the backward (landward) tilting of the late Pleistocene marine terraces, even though upheaval of transgressive surface is not clearly observed.

2) Discovery of active faults

Two west-side-up active faults, partly showing monoclinical appearance, have been identified 1 to 3 km east of the above-mentioned two anticlines (Figs. 1, 2). Precise interpretation of the sonic profiles leads to a conclusion that the two active faults ruptured at least twice, at the early stage and the middle to late stage of the postglacial transgression (possibly between 13 and 5 ka).

3) Contribution to the evaluation of the Kuromatsunai-Teichi Fault Zone

The recognized southern end of this fault zone extends southwards for 10 km from the conventional fault tip, and the fault zone length will change from 32 km or longer to 42 km or more. The cumulative vertical displacement in the postglacial transgression stage is estimated, at the most, to be 4 m for the fault off Oshamambe, and 5 m for the fault off Kunnui. The vertical displacement per event might have attained 2 m at the maximum on the fault off Oshamambe, and 2 to 3m on the fault off Kunnui. The recurrence interval of rupturing of the submarine faults is roughly estimated at several to seven thousand years.

REMAINING ISSUES

The western to southern coastal area of Uchiura Bay still remains a gap of geologic information, while the Yakumo Fault Zone and another active fault are known on the western and southern coasts of the bay, respectively. Therefore, it is necessary to conduct active fault survey for the western and southern coastal zones of Uchiura Bay in order to reveal the relationship between the Kuromatsunai-Teichi Fault Zone and the two faults.

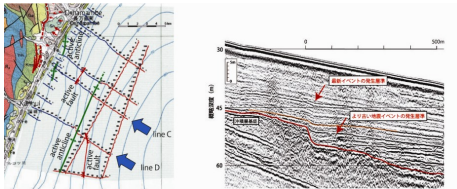


Fig. 1 Survey lines and newly found active structures.

Fig. 2 Reflection profile around the active fault found at C1-24 on Line C and identified faulting events.

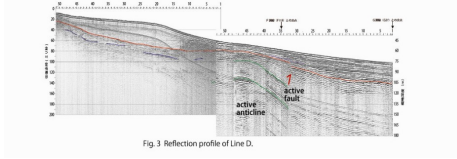


Fig. 3 Reflection profile of Line D.

Keywords: Kuromatunai-Teichi Fault Zone, active fault, active fold, sonic survey, Uchiura Bay, boomer