

HDS029-01

Room:302

Time:May 24 10:45-11:00

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.

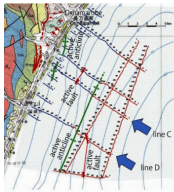


Fig. 1 Survey lines and newly found active structures.

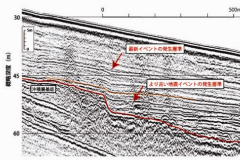


Fig. 2 Reflection profile around the active fault found at C1-24 on Line C and identified faulting events.

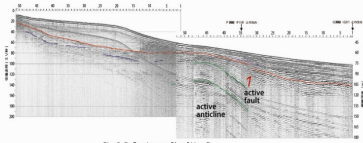


Fig. 3 Reflection profile of Line D.

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

HDS029-02

Room:302

Time:May 24 11:00-11:15

Offshore active fault survey "Futagawa-Hinagu Fault Zone" -Outline and main survey results

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The 100-km-long Futagawa-Hinagu Fault zone distributed from piedmont of the Aso volcano to the Yatsushiro Sea. The southwestern extent of fault zone composed many NE-SW trending faults, mainly right-lateral strike-slip faults, in the Yatsushiro sea bottom. We conducted a combined survey of the Yatsushiro sea fault group, as a part of the 2010 offshore active fault survey project of MEXT. The survey comprises high-resolution multichannel sonic survey, ultra-high-resolution sonic survey and paleoseismological piston coring to clarify the fault-trace distribution, its activity and faulting history.

Keywords: Futagawa-Hinagu Fault Zone, Offshore, active fault, sonic survey, piston-core, strike-slip fault

HDS029-03

Room:302

Time:May 24 11:15-11:30

Tectonic landforms and active structures of the Yokote Basin, northeast Japan

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We found some deformed fluvial terraces in the eastern margin of the Yokote Basin on the basis of precise geomorphic interpretations using large scale aerial photographs. Newly mapped active faults in the northern part of the basin indicate that we should reexamine the trace of the surface ruptures associated with the 1896 Rikuu Earthquake and the active fault structures fringing the eastern margin of the basin. In the southern part of the basin, some dextral active faults are dominant. The characteristics of fault traces and gravity anomalies suggest a quite different picture from that of northern part for basin development. Careful geomorphic interpretations are very useful for reconstruction of more reliable long-term risk evaluation of earthquake. In order to understand the natures of tectonic development, geomorphic investigations are inevitable.

Keywords: fluvial terrace, fault topograph, active fault, fault structure, Yokote basin

HDS029-04

Room:302

Time:May 24 11:30-11:45

Drilling survey across the active reverse fault zone along the eastern margin of the Yokote Basin, northern Japan

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The active reverse fault zone along the eastern margin of the Yokote Basin is one of the largest active thrust fault system in northern Japan. Taniguchi et al. (2007) carried out careful interpretation of large scale air photographs for more detailed mapping of active fault traces based on observation of minute tectonic landforms. Newly mapped fault traces in the southern part of the active reverse fault zone along the eastern margin of the Yokote Basin near Yokote city. The authors carried out drilling survey across northern end of this fault traces, in Akagawa town west of Yokote city. The active faults are expressed as west facing flexure scarp which is about 1 m high. Evidence of borehole stratigraphy indicates that the faults in study area displaced progressively after about 30ka.

Keywords: active fault zone along eastern margin of Yokote Basin, active fault, reverse fault, drilling survey

HDS029-05

Room:302

Time:May 24 11:45-12:00

Relationship between landslides caused by 1556 M8.5 Huaxian earthquake and active faults in eastern Weihe Basin, China

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Earthquake-induced landslides have been reported in association with many moderate to large earthquakes, causing many casualties and large economic losses, which have been paid great attention to and widely investigated around the world (e.g., Harp and Jibson, 1996; Ren and Lin, 2010). Most earthquake-induced landslides are concentrated in the areas around the epicenter of large earthquakes over a distance of tens of kilometers. Recent studies reveal that there is close relation between the distribution and topographic features of earthquake-induced landslides along the co-seismic surface rupture zone, which is effected by the pre-existing active faults, e.g., the earthquake-induced landslides caused by the 2008 M_w 7.9 Wenchuan earthquake (Ren and Lin, 2010).

The locations of landslides can be identified by interpretations of Remote Sensing images and structural analysis of digital elevation model (DEM) data, which are controlled by the tectonic topography developed along the pre-existing active fault.

In this paper, we present case study of the earthquake-induced landslides caused by the 1556 M 8.5 Huaxian earthquake occurred in the Weihe Basin, central China. The Great Huaxian earthquake occurred on 23 January 1556 in the eastern Weihe Basin, central China, resulting more than 820,000 fatalities and widespread damage in the densely-populated region around the Xi'an city, an old capital of China.

We use high-resolution IKONOS and WorldView remote sensing images to identify the locations of landslides along the south margin of eastern Weihe Basin. Topographic analysis is conducted with 30-m resolution Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model (GDEM). The results have been confirmed by the field investigations.

The landslides caused by the 1556 great Huaxian earthquake mostly occurred in the south margin of the eastern Weihe Basin where many active normal faults are developed. The landslides are mainly developed upon steep slopes (30-60°) along the active normal fault zones within the margin zone between the Weihe Basin and Huashan Mountains. A cluster of landslides including the greatest landslide of $> 6 \text{ km}^2$ are developed along the Huashan Piedmont faults near the Huaxian city where is inferred as the epicentral area of 1556 M 8.5 earthquake. Based on the distribution of landslide and deformation features of active faults and disaster distributions recorded in the historical documents, it is inferred that the landslides are concentrated in the epicentral area of 1556 great earthquake.

Keywords: Landslides, Active faults, 1556 M 8.5 Huaxian earthquake, Eastern Weihe Basin, Central China

Japan Geoscience Union Meeting 2011

(May 22-27 2011 at Makuhari, Chiba, Japan)

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HDS029-06

Room:302

Time:May 24 12:00-12:15

Distribution of active faults crossing highways in west Japan and some consideration of a countermeasure by bridge

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abstract

Keywords: west Japan, highway, active fault, suspension bridge

Japan Geoscience Union Meeting 2011

(May 22-27 2011 at Makuhari, Chiba, Japan)

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HDS029-07

Room:302

Time:May 24 12:15-12:30

Information of active fault traces for earthquake hazard reduction

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Numerous active fault maps were published in Japan. These maps show active fault trace lines in various scales. In large-scale maps, active fault traces are indicated precisely, however these lines do not show the location of source faults. Active fault maps in response to various purposes are needed for earthquake hazard reduction.

Keywords: active fault, map, information, scale, earthquake, hazard reduction

Japan Geoscience Union Meeting 2011

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HDS029-08

Room:302

Time:May 24 12:30-12:45

The First Photo Contest of Active Faults in Japan and its Implication in Mitigation of Earthquake Disaster

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The Japanese Society of Active Fault Research had carried out successfully the first photo contest of active faults in Japan last year. We will make a presentation of its result and its implication in mitigation of earthquake disaster due to active faults.

Keywords: Active fault, mitigation of earthquake disaster, photocontest, active fault 100, tectonic geomorphology, geopark