

Offshore active fault survey "Unzen Fault Group" -Outline and main survey results

Yuichi Sugiyama^{1*}, Tanio Ito², Izumi Sakamoto³, Tomoo Echigo⁴

¹AFERC, AIST, GSJ, ²Chiba University, ³Tokai University, ⁴Geo-Research Institute

The 60-km-long Unzen Fault Group is traversing the Shimabara Peninsula and extending into Shimabara Bay to the east and Tachibana Bay to the west. The fault group is divided into three fault zones: the northern, southwestern and southeastern zones. Among these, the northern and southeastern fault zones still lack reliable and precise information on fault-trace distribution, activity and faulting history.

Under the circumstances, we have carried out a comprehensive survey of the northern and southeastern fault zones of the Unzen Fault Group, as a part of the 2009 offshore active fault survey project funded by MEXT. The survey comprises deep seismic reflection profiling, high-resolution multichannel sonic survey, ultra-high-resolution single-channel sonic survey and paleoseismological piston coring.

The seismic survey using 460-cubic-inch air gun and 24-channel streamer cable clearly images 2- to 3-km-deep N-S reflection profiles of Shimabara Bay. They are characterized by reflectors cumulatively tilting southward. The strong reflection surface assignable to the base of the Unzen Quaternary system, about 500 ka, is displaced by the north-side-down Futsu Fault, the main constituent of the southeastern fault zone, and the vertical displacement of the basement reaches around 1000 m.

The high-resolution sonic survey using boomer source and 12-channel streamer reveals S80-85E-trending active normal faults in the northern Shimabara Bay where no active fault data have been obtained even though the area is at the immediate front of the northern fault zone. The faults have been traced for 8 km, but their eastern extensions are not ascertained because of acoustic dispersion layers off Kumamoto City.

The ultra-high-resolution sonic survey using 100-kHz primary frequency, 3.6-deg. narrow-beam parametric sediment echo sounder clearly images normal faults in the shallow zone from the sea bottom to a depth of 20 m, and has contributed to locating sites for the piston coring in Tachibana Bay. The survey also has discovered closely-spaced, E-W-trending active normal faults in the northernmost part of Shimabara Bay.

The piston coring aims at the easternmost part of the Futsu Fault and a newly discovered fault in the northern Shimabara Bay, as well as two faults in Tachibana Bay, which are clearly imaged by the ultra-high-resolution sonic survey. 5 cores, 10 to 11 m long, were obtained in Tachibana Bay, and 3 cores, 7 to 9 m long, were extracted in Shimabara Bay. We are now carrying out various kinds of analyses and measurements, including facies, grain size, bulk density, magnetic susceptibility, tephra and ¹⁴C dating. We intend to clarify faulting history and slip per event of each target fault.

Keywords: Unzen fault group, offshore, active fault, sonic survey, piston core, normal fault