Submarine Geologic Structure of the Southern Part of the Hakodate-heiya-seien Faults - an example of fault related fold-

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Hakodate-heiya-seien fault systems is active faults distributed in the west end of the Hakodate Plain at southern part of the Oshima Peninsula in southern Hokkaido Japan with west dip reverse faulting (ex. Hokkaido, 1999).

Seismic profiles obtained by Hokkaido(1999) and the authors across these active faults reveal subsurface flexure structure below these active faults.

The most recent active part of these active faults are situated at the east-end of active faults and strata in the western part of the active faults are steep inclined folded and faulted, which suggests the former active fault movement.

These suggest that active zone has been forwarding from western part to eastern part, and the ultimate active zone is the east end part of the faults which is boundary of the alluvial plain and mountainous district, as Hokkaido(1999) described.

The seismic profiles reveal that steeper incline strata in western part than that of eastern part, this shows the same conclusion.

There are many cases these reverse active fault forwarding to plain side from mountainous district side. Togo(2000) named this forwarding of reverse active fault zone thrust front migration.

According to the case of these reverse faults, seismic profile dose not reveal the deeper structure as earthquake source fault although show the subsurface flexure structure in shallower part.

Often subsurface flexure structure usually dose not show the deeper earthquake source fault. Okamura(2000) and Suppe et al.(1992) propose these relationship of subsurface flexure structure and deeper reverse fault as fault related fold.

The north end of these faults is situated at the boundary of the Hakodate Plain and the mountainous district around Mt. Kizibikiyama, but the south end is situated at the seashore of Hakodate Bay, so these faults is thought continue to submarine area (Earthquake Research Committee, 2001).

Seismic prospecting was performed by the authors in the Hakodate Bay using air gun source digital-multi channel prospecting and Sparker source and Geo-pulse source single channel analogue prospecting in order to research shallower to deeper geologic structure with high resolution.

By sonic prospecting and submarine core analysis, Mochida et al. (2001) analyzed submarine stratigraphy of the Tsugaru Basin into A-Formation to E-Formation. According to Mochida et al. (2001), A-Formation is Holocene, B1-Formation is Upper Pleistocene, B2-Formation and B3-Formation are Middle Pleistocene , and C-Formation is Upper Pliocene to Lower Pleistocene.

The prospecting in the Hakodate Bay has revealed at the southern extension area of the faults, the Holocene and the lower formations indicate flexure structure and this structure continue to the on land area with flexure structure and topography in the south end of faults.

These flexure structure is distributed continuously through offshore Cape Kattoshi, but at the south-western extension part seismic profile show geologic structure with incline to offshore. This geologic structure is thought growth triangle (Suppe et al. (1992)) which is appeared in upper part of deeper fault. At offshore Cape Saraki which situated in the southwestern direction to Cape Kattoshi, seismic profile indicate that growth triangle structure terminates in the Lower Pleistocene. Therefore these fault movement had finished by Middle Pleistocene times.

From these things, in active part of Hakodate-heiya-seien faults growth triangle terminates to near surface and causes thrust front migration. But in the southern part of faults is inactive now and in the southwestern part offshore Cape Saraki, fault has not been active since Middle Pleistocene times.