Neotectonics of the northern Itoigawa-Shizuoka Tectonic Line and Toyama Trough, central Japan

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The Itoigawa-Shizuoka Tectonic Line (ISTL) bounding East and West Japan was formed, in origin, as one of transform faults during Paleogene back-arc spreading the Present Japan Sea region. During the Early Miocene time, ISTL and its northward elongation, Toyama Trough, performed as a juncture zone that accommodated opposite directions of arc-rotation known as the 16 Ma bending of Honshu Arc demonstrated by paleomagnetic studies. As the result, Honshu arc had been separately evolved into Northeast (NEJ) and Southwest Japan (SWJ) arcs. Each intra-arc rifting occurred in their inner belts, and different trends of faults adjoined along ISTL and Toyama Trough (Fig.1). The northern ISTL might have reactivated as an oblique (N-S) transfer fault accompanied by NE-SW trending normal faults to form the western sedimentary basin, including the Minochi and Nish-Kubiki sedimentary basins, in the northern Fossa Magna.

At the end of Miocene, a convergent movement characterized by fault controlled folds had commenced along the island-arc margin of Japan Sea. As the easternmost SWJ arc, both ISTL and Toyama Trough seem to be an alignment of boundaries of tectonic stress provinces inferred from fault distribution pattern (Fig.2). It is has been reactivated again in the Quaternary to generate large earthquakes.

Four major issues on active tectonics in and around the northern Fossa Magna are discussed and addressed:

1. Seismicity and stress field on the north central Japan

ISTL is a boundary of active fault provinces of strike-slip and reverse faults, although a uniform stress field is recognizable in central Japan. ISTL has been a border between SWJ and NEJ in the regional tectonic stress history.

2. Termination of seismic thrust belt

ISTL is the southwestern termination of the Tectonic Belt along the Eastern Margin of Japan Sea (Shinanogawa Seismic Zone).

3. Intersection of ISTL with NKTZ

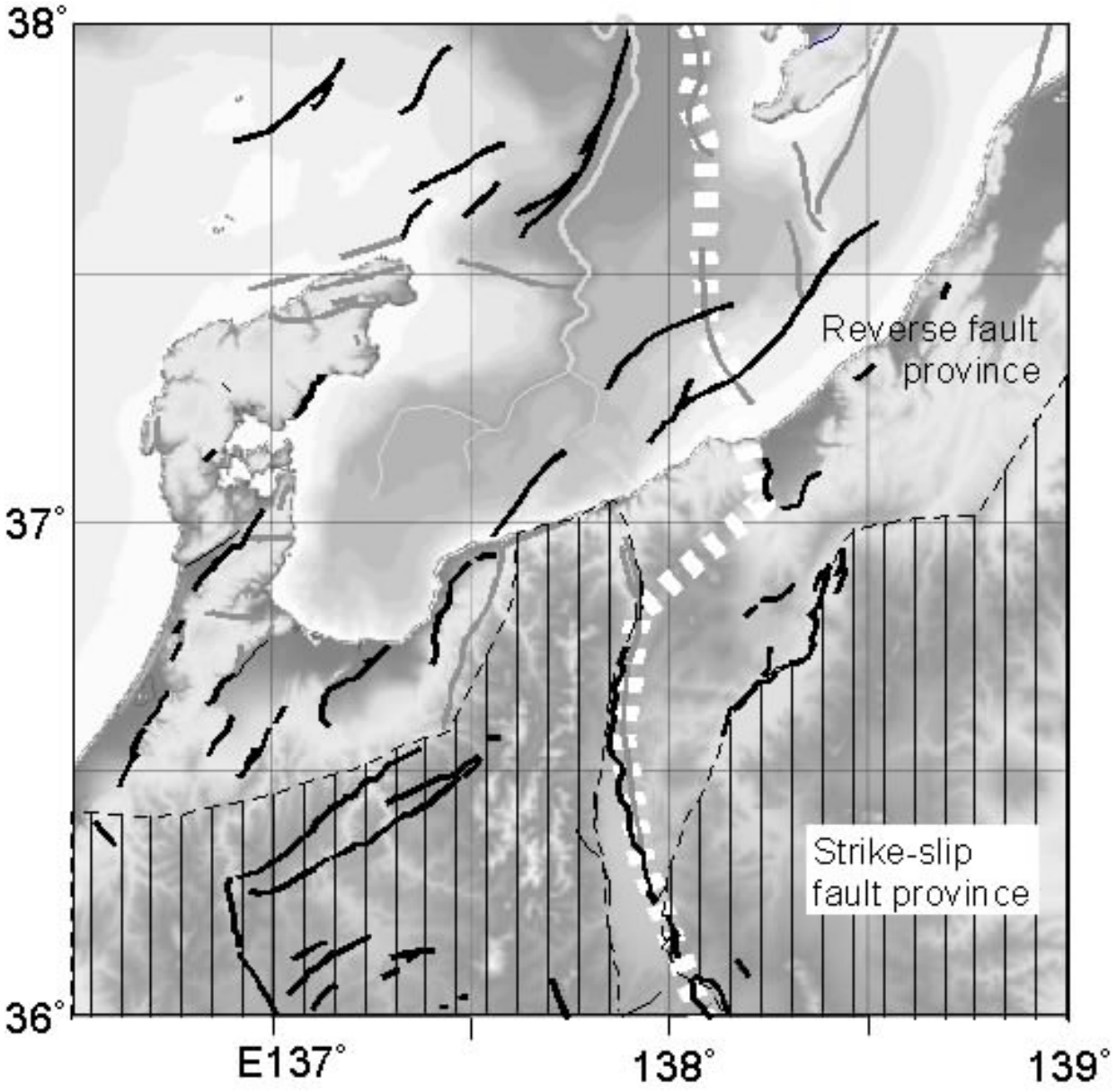
Within the Niigata-Kobe Tectonic zone (NKTZ), the Atotsugawa Fault system extends northeast beyond ISTL and no active fault is recognizable along ISTL.

4. Attitude of Fault surface

A high-angled attitude is probable from the above viewpoint of origin and development of ISTL. According to the results of seismic profiling along the Toyama Trough and ISTL, a

basement-involved tectonics is possible for seismic faulting in the northern Fossa Magna as well as in the western half of central Japan.

Conclusively, a duplex stress field is proposed for the northern Fossa Magna region., especially in the 'Western Sedimentary Basin'. Both transpressional thrusting along the narrow zone of ISTL and northwest dipping thrust faulting in the Shinanogawa zone are observable near the surface of the thick sedimentary cover. Meanwhile, inferred from the focal mechanism solutions, strike-slip faulting is common in the basement down to some 10 km beneath the sedimentary sequence as well as in the Central Uplift of Fossa Magna such as the 'Matsushiro earthquake'. Outcrops of strike-slip fault are easily and reasonably observed on the surface in the SWJ side of ISTL, where sediment cover was already eroded out to expose the basement.


38°
37°
36°
E137°
138°
139°
Reverse fault province
Strike-slip fault province