

Report on the Fujikawa kako fault system~ Itoigawa-Shizuoka Tectonic Line seismic profiling, FIST. (2) Deep structure

Tanio Ito^{1*}, Ken-ichi Kano², Yasutaka Ikeda³, Noriko Tsumura⁴, Shintaro Abe⁵, Kenji Nozaki⁴, Satoshi Yamakita⁶, Tetsuya Takeda⁷, Kiyoshi Kato⁸, Go Sato¹, Jiro Komori¹, Takaya Iwasaki³, Hiroshi Sato³, Toshiki Watanabe⁹, Akira Fujiwara¹⁰, Susumu Abe¹⁰, Kei Odawara¹¹, Yoshiki Matsuura¹²

¹Teikyo Heisei University, ²Shizuoka University, ³University of Tokyo, ⁴Chiba University, ⁵AIST, ⁶Miyazaki University, ⁷NIED, ⁸Komazawa University, ⁹Nagoya University, ¹⁰JGI, ¹¹Hot Springs Research Institute of Kanagawa Prefecture, ¹²Geebec

It is difficult to interpret the deeper part of the FIST profiles processed by the conventional method, although the profiles contain many events. Therefore we try to visualize both the velocity heterogeneities and the dominant event patterns by the following techniques.

1. To overlay the velocity structure obtained by tomographic analyses on the profiles.
2. To distinguish and classify the dominant event patterns in the MDRS (Multi-dip reflection surface) profile as follows:
 - 1) Skeltonization of the events.
 - 2) Classification in average dips of events and degrees of average event-lengths in skeltonization attributes.

Thus we successfully recognize the following five subsurface domains of A to E.

A: Foreland of the Fujikawa kako fault system.

Horizontal or subhorizontal events are dominant down to about 4000 m deep.

B: Fujikawa kako fault system (in a broad sense)

W-dipping reverse faults, the Omiya, the Agoyama, the Shibakawa, and the Noshita faults are arranged from east to west. W-dipping events are dominant down to about 6000 m deep parallel to the faults. The velocity structure suggests that the main activity in the four faults have been migrated eastward from the Noshita to the Omiya faults.

C: Between the Noshita and the Neguma faults

W-dipping events are dominant down to about 5000 m deep between the Noshita and the Neguma faults. Although both the Noshita and the Neguma faults are dipping west at about 45 degrees, the former is a reverse fault and the latter is a normal one.

D: Between the Neguma and the Tashirotoke-Otoshita faults

An open syncline is inferred from the velocity structure between the Neguma and the Tashirotoke-Otoshita faults. The W-dipping Neguma fault is cut at about 3000 m deep by the high angle W-dipping Tashirotoke-Otoshita fault which displaces the 5000-m/s-strata reversely at about 2500 m.

E: From the Tashirotoke-Otoshita fault, across the Itoigawa-Shizuoka Tectonic Line, to the Jumaiyama Tectonic Line

This domain is characterized by the left lateral with reverse faults, all of which are W-dipping at high angle.

A relatively dense event zone (DEZ) of about 2 km thick is dipping westward at about 20 to 25 degrees from about 5 km deep (beneath the Omiya fault at surface) to about 10 km deep (beneath the Neguma fault at surface). The lower boundary is considerably prominent due to the contrast with the wide poor-event domain beneath it. Although there are not any continuous reflectors along the lower boundary, it is reasonable that the boundary corresponds to the upper surface of the Philippine Sea plate judging from the seismicities obtained by Hi-net of NIED. The reason why typical reflectors are not seen along the upper surface is that there is no strong impedance contrast between the Philippine Sea plate and the overlying strata of the Honshu arc. In reality both are originally the same materials derived from the Izu volcanic arc.

The deeper part of the Omiya fault probably merges into the upper part of the DEZ at about 6000 to 7000 m deep. The deeper parts of the Shibakawa and the Noshita faults may reach a gently e-dipping event zone at about 5000 m deep. The zone corresponds to 5300 m/s contour. The relationships between the deeper parts of the faults in Domain E and the subducting PHS are not clarified.

Keywords: Fujikawa kako fault system, Itoigawa-Shizuoka Tectonic Line, Philippine Sea Plate, seismic survey, MDRS