Partitioning of slip on the ISTL active fault system, central Japan, in Quaternary time

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Geometry and the amount of slipping on the active fault where the earthquake is caused are important for prediction of seismic risk. The slip rate is uncertain though the geometry of the fault is clarified to the structural exploration. The slip rate is uncertain though the geometry of the fault is clarified by the structural exploration. The tectonic geomorphology was able to estimate the deformation rates, but the structure had not been so considered.

In the Fujimi area, two faults, trending NW-SE, run parallel to each other: the Aoyagi fault in the east and the Wakamiya fault in the west. The distance between these two faults is 1-2 kilometers. The Wakamiya fault is inferred to be a left-lateral strike-slip fault, based on the fact that its surface trace shows right-stepping echelon arrangement (Sawa, 1985; Arai et al.,2000). On the other hand, the Aoyagi fault is associated with significant back tilting on its upthrown side, and hence is inferred to be a reverse fault (Sawa, 1985; Sawa et al.,1999). As a result of the reflection survey, it is clear that the Aoyagi fault is a low-angle thrust fault dipping 15-20 degrees to the west and that the Wakamiya fault dips 60-70E. According to their interpretation, the fault in this area is characterized by oblique slip motion. The master fault then branches, up dip into a low-angle thrust fault (the Aoyagi fault) and a high-angle, east-dipping fault (the Wakamiya fault), on which strike-slip component is accommodated. The mechanism of slip partitioning in the ISTL is different from that in oblique-subduction zones.

The structure and surface deformation of the Matsumoto area are quite complex, and are characterized as follows. From gravity anomaly, the material boundary is located at the Matsumoto-Bonchi-Toen fault at Toyoshina, extending southward to the west margin of the Akagiyama anticline. It shows straight and continuous traces, although its surface manifestation is missing between Toyoshina and Akagiyama. The mechanical boundary in the north (the Matsumoto Bonchi Toen fault) is simple and corresponds to the material boundary. The mechanical boundary in the south is complex, and consists of a strike-slip fault (the Gofukuji fault), some secondary thrust faults and an east-dipping blind thrust probably lying beneath the Akagiyama anticline. However, the mechanical boundary in the middle is missing; instead, a localized depression (the Fukashi Basin) develops on the hanging wall side of the material boundary. The Fukashi Basin is at the transition between a simple oblique-slip fault and a set of complex spray faults on which slip partitioning is taking place. The northern end of the Gofukuij fault is placed in the middle of the calculation area. Calculations show that the overall pattern of surface deformation is simulated well by dislocation model.

The strike-slip fault in the oblique-slip portions of the ISTL merge at a shallow depth into the underlying, low-angle master fault. Since these branch faults develop above seismogenic depths, they would move passively in association with oblique slip on the master fault at depth. Therefore, every time the master fault moves, both the strike-slip and thrust faults near the surface likely to move simultaneously. Such behavior is quite different from that of an oblique-subduction zone; the intra-arc strike-slip fault and the plate interface are predicted to move independently from each other, because they are mechanically decoupled by intervening asthenosphere.