Study of tectonic landforms and late Quaternary slip rates along the northern part of the Itoigawa-Shizuoka tectonic line

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We conducted a tectonic geomorphological survey of the northern Itoigawa-Shizuoka Tectonic Line with support from the Ministry of Education, Culture, Sports, Science and Technology of Japan. This survey clarifies the detailed distribution of the slip rates of this fault that will enable us to forecast its behavior and estimate the strong ground motion associated with an earthquake.

The active faults were mapped along the northern Itoigawa-Shizuoka Tectonic Line using interpretations of aerial photographs that were taken in the 1940s or 1960s at scales of 1:10,000 and 1:20,000, respectively. This was supplemented by field observations. The landform deformations due to faulting were analyzed based on 68 transactions that were measured using the photogrammetric system. We calculated the vertical slip rates of the faults based on the ages of terraces (H: 120 kyrs, M: 50–100 kyrs, L1a: 20 kyrs, L1b: 10 kyrs, L2: 4–7 kyrs, L3: 1–2 kyrs) at 68 points. The vertical slip rates of the faults located in the northern part are vertical 0.2–2 mm/yr on the L terraces (less than 20 kyrs) and 0.05–0.9 mm/yr on the M and H terraces (more than 50 kyrs). The vertical slip rates of the faults located in the central and southern areas are 0,2–2 mm/yr.

For the further development of the strong ground motion simulation, a problem that requires to be addressed is the authentication of the methods used to determine the location and slip amount of asperities on a fault plane where the coseismic slip is almost double that of the background area. Therefore, active fault studies with field data are expected to increase. However, it is rare the field observation points under a humid climate and highly urbanized conditions in Japan where the coseismic surface displacement of the latest earthquake rupturing could be identified along active faults with thousands of recurrence interval. An alternative model based on the slip rate distribution, if the characteristic earthquake model is approved for active fault behavior, it might provide a clue regarding the asperity location. Thus, this research project also aims to demonstrate the validity of the use of digital photogrammetry and the airborne-LIDAR system for the acquisition of a large planarity altitude dataset to measure fault displacements and discuss the locations of asperities.