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Elucidation of fault flexure and fault parameter that uses computer simulation

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The displacement of the bed rock spreads to the stratum as a result of the faulting, and the fault scarp appears in surface of the earth usually. The stratum is being severed by the fault plane under the fault cliff. However, the fault displacement occasionally appears in surface of the earth as fault flexure. The stratum keeps continuousness under fault flexure. However, when fault flexure is generated, the width of fault flexure is exceeding 100 meter like the Tachikawa fault. It is thought that the difference of the width of the displacement of the stratum by the fault reflects the difference of the generating mechanism of the fault scarp and fault flexure. However, the reason why the mechanism is different has not been clarified.
In the fault investigation of the past, the fault activity history and the amount of the fault slip are estimated from the gap of the stratum generated by the earthquake. Therefore, the gap is not generated in the fault and it is difficult in fault flexure to decide the activity history and the displacement. It is necessary to estimate the activity history and the amount of the unit displacement to request generated magnitude scales of earthquakes and average displacement speed, etc. The development of the technique to estimate the activity history and the amount of the unit displacement is hoped for from the feature of fault flexure.

Then, the program to simulate the transformation of the stratum generated by the displacement of the bed rock by the fault was developed in the present study. Conditions of the kind of the stratum (soil and gravel, etc.) and the thickness of the stratum and the amounts of the fault of the unit displacement were changed and the transformation of the stratum was simulated. The condition that fault flexure is generated and the width of flexure ware decided by simulation. Moreover, the generating mechanism of fault flexure was analyzed by analyzing the place where power and the stratum applied to the stratum in the fault slip were transformed.

Up to now, a lot of finite element methods have been used in the simulation of the geological features field of transformation of the stratum by the fault movement. The advantage of the finite element method is that the material boundary is clear because the mesh is transformed with the movement of the material. However, neither the lage transformation nor the division of the medium are computable. In the simulation of the fault, the rupture of the stratum by the fault slip and the stratum's around the bed rock being not able to simulate shape very much is a problem. Because the mesh doesn't move in the difference method, the large transformation of the material and the division of the material can be calculated. However, there was a problem that the boundary of the material becomes indistinct by numeric diffusion in a current difference method. Therefore, the difference method had not been so used in the simulation in the geological features field. In this study, the simulation was tried by using the CIP method that is a kind of the difference method. The material boundary is Sharp because it can lose numeric diffusion by using the technique said digitizing in the CIP method. The simulation code of the CIP method is more concise than that of the finite element method. Moreover, the computational speeds are earlier than finite element methods and making to the parallel is easier.

The stratum is gravel and when the amount of the unit displacement is small compared with the thickness of the stratum, the thing that fault flexure is generated has been understood. Oppositely, when the stratum was gravel and the amount of the unit displacement was large to the thickness of the stratum or the stratum was soil, the thing that the fault scarp is generated was understood.

Keywords: active fault, fault flexure, numerical sumulation, strata deformation, CIP method