Generation condition and mechanism of faults flexure -Example of Tachikawa fault-

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Tachikawa fault is 21km length, go through Tokyo Tachikawa, Musasino plateau and Azuyama hill.Fault is situated at metropolitan area.Consequently attracted, because that causes under metropolitan area earthquake directly above its epicenter.

But, Tachikawa fault is covered with Tachikawa gravel layer and Kazusa layer, consequence fault appears 100-200m width flexure at surface.

Therefore, structure of fault underground is unknown. Especially reasons of flexure structure formation is not solved. So, we use computer simulation to solve flexure structure formation reason.

We use CIP method for simulation. CIP method is kind of difference method.

Up to the present time,finite element method was used for geological simulation.But, finite element method's weak point is that mesh is moving with medium therefore cannot calculate large transformation, division and fusion of mediums. At difference method, mesh is stopping about medium therefore can calculate large transformation, division and fusion of mediums. Advantage of CIP method is very small numerical diffusion by comparison with normal difference method.

Geological material can regard Bingham fluid in this simulation. For example clay and gravel.

Bingham fluid property is that viscosity is changed by strain rate. Bingham fluid viscosity is small if strain rate is fast, but if strain rate is slow viscosity is large.Bingham fluid example is clay.If we push clay, strain rate is fast, therefore viscosity is low, consequence clay is dented.If we release clay, strain rate is near zero. therefore viscosity is very high, in other words solid body,consequently clay's dent keep changeless.

First, we make experimental device for analogue fault experiment. Purpose of this experiment is check that our simulation code simulates physical phenomena really. We compares experimental result with simulation result for that reason. As a results, simulation results resembled analogue experimental results in respect of flexure structure.

Tachikawa fault's one time displacement is 1.8m by geologic reconnaissance. Tacikawa fault's fault angle is unknown. But Tachikawa fault was formed inversion tectonics, therefore we decided fault angle is 45 degree. Tachikawa fault's bed rock depth is 500m by geologic reconnaissance. We make Tachikawa fault model by above condition.

We divide the geological material into clay and gravel by property. These material is existing under Tachikawa fault. Clay's character is strain weakening. The cohesion and internal friction angle are decreasing when strain was increasing if there is a character of strain weakening. Gravel have not property of strain weakening.

We simulate two pattern. First pattern is that layer is composed by clay. Second pattern is that there is layer of sand on clay.

Result of our experiment, it turned out that existence of gravel layers above clay layers are indispensable to generate fault flexure. We repeat simulation at gravel layer thickness changed. According to the experiment result flexure width is proportionate to gravel layer thickness.