The thermal record analyses of rocks nearby Mozumi-Sukenobu fault using thermochronologic method

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Investigating heat generation and transformation along the fault is a key to understand dynamics of faults.

To investigate the thermal history of rocks nearby faults, geothermometer is used. In these techniques, fission-track (FT) thermochronology has recently been applied to detect the thermal anomaly in fault zones. The FT method is suitable for detecting the thermal anomaly in fault zones because: (1)temperature is the only factor to cause track annealing; (2)FT annealing kinetics are documented; (3)minerals such as zircon used for analysis are resistant to weathering; and (4) in a few seconds heating experiments, zircon FT annealing was confirmed. In addition, helium consisting in zircon is available for (U-Th)/He thermochronology. Supposing a same time and temperature thermal event, in geological time scale, helium retaining is larger than FT annealing, so ZHe age is younger than ZFT age. From the extrapolation of helium retaining kinetics, in a few seconds time scale, it is predictable helium retaining is less than FT annealing, so ZHe age may be older than ZFT age.

Fourteen sandstone samples from Tetori Group were collected from the research tunnel which penetrates through the Mozumi-Sukenobu fault, central Japan, which belongs to Atotsugawa fault group. ZFT ages, ZHe ages and ZFT length distributions of zircons were measured.

ZFT ages show that most of grains are younger than depositional age of Tetori Group (˜150Ma), indicating heating event after the deposition.

In three samples, ZFT age and ZHe age are 81.6+/-13.1Ma (1 sigma) and 63.4+/-23.8Ma, 81.4+/-17.8Ma and 94.6+/-3.7Ma, 89.2+/-14.1Ma and 80.9+/-7.9Ma, respectively. These results suggest the heat source of this heating event is not frictional heating of faulting.

On another front, between two fracture zones identified in the tunnel, ZFT ages are younger compared with other sampling points, while track lengths are longer. These facts indicate that paleo-temperature by heating event was the highest in rocks between fracture zones. Present structure in paleo-temperature might be explained by the selective heat transfer in there.