Thermochronological investigation of seismogenic fault zones: an overview and examples from Japanese Islands

TAKAHIRO TAGAMI [1]

[1] Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University, Sakyo-ku, Kyoto, 606-8502, Japan. tagami@kueps.kyoto-u.ac.jp

The timing of faulting episodes can be constrained by radiometric dating of fault-zone rocks. Fault-zone material suitable for dating is produced by tectonic processes, such as (1) fragmentation of host rocks, followed by grain-size reduction and recrystallization to form mica and clay minerals, (2) secondary heating/melting of host rocks by frictional fault motions, and (3) mineral vein formation as a result of fluid advection associated with the fault motions. The thermal regime of fault zones consists primarily of the following three factors: (a) regional geothermal structure across the fault zone and background thermal history of studied province bounded by fault systems, (b) frictional heating of wall rocks by fault motions, and (c) heating of host rocks by hot fluid advection in and around the fault zone. Thermochronological methods widely applied in fault zones are K-Ar ($^{40}Ar/^{39}Ar$), fission-track, and U-Th methods. The thermal sensitivities of individual thermochronological systems are briefly reviewed, which critically control the response of each method against the thermal processes. Based on the knowledge above, representative examples as well as key issues are highlighted to date fault gouges, pseudotachylytes, mylonites and carbonate veins, placing valuable constraints upon geological, geomorphological and seismological frames. Finally, the results from Japanese Islands are presented, including the Shimanto belt, as examples for multiple applications of thermochronological methods.

Geobotany and biogeochemistry of Sungun Copper deposit, northern Iran: An implication to mineral exploration

B. TAGHIPOUR[1] AND M. HEMMATI[1]

[1]Department of Earth Sciences, Shiraz University, Shiraz, Iran (taghipour@shirazu.ac.ir)

Sungun porphyry copper deposit is located in the east of Azarbaidjan, NW of Iran. Geobotany is one of the important methods in mineral exploration. In this method the plants represented paid a heavy metal track. Geochemical prospecting has been carried out on distribution of Zn, Pb, Cu, As, Cd and Mo in the plant species and soil of the Sungun Cu-Mo deposit. Field prospecting has been indicated that Anthemisnobilis, Crepsis sancta and Picnomonacarna are the main plant species in the area. Geochemical results indicated enrichment of Mo, As and Cu (Cu >Mo > As) which is correlated with concentration of the metals in associated soil. Anthemisnobilis has been shown the greatest capability for accumulating Cu and Mo in its tissues through soil so it could be used as a bioindicator for mineral exploration. This plant with other plant species such as Crepsis Sancta and Picnomonacarna have high scavenging ability for Mo and Cu from the soil and could cause serious environmental and health problems in the living organisms of the area.

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