System report and measured data from geological samples using the new (U-Th)/He dating system at Tono Geoscience Center, JAEA

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Though the (U-Th)/He dating method that regards helium-4 nuclei (alpha particles) as the daughter products from radioactive decays of uranium and thorium has been already recognized since the beginning of the twentieth century, the idea was considered to be impracticable except for some particular cases by reason that helium was not completely retained in rocks. In 1987, it was revealed that the (U-Th)/He ages of apatites might be cooling ages with very low temperature cooling. Because of the suggested useful possibility in geo- and thermochronology, the (U-Th)/He method has been quickly developed since 1990's. The excellent points for applications are such as below: (1) Closure temperatures are very low, e.g. ˜70oC for apatite and ˜180oC for zircon. (2) Uranium bearing minerals, especially zircon, are often weathering- and alteration-resistant. (3) It is possible to date using single grain. (4) Non-radiogenic helium including blank is generally rare. (5) The rates of helium ingrowths are large. (6) It does not require a reactor or a large-scale exclusive mass spectrometer. The (U-Th)/He method mainly applies to investigate a younger event on a cooling or exhumation history of present rapid orogen and a younger thermal anomaly through an active fault than those investigated by traditional methods because of merit (1). This method is suitable for dating young ages from merit (4) and (5). It also works well for the investigation for the last event.

Japan Atomic Energy Agency have jointly set up the lab of the (U-Th)/He dating in cooperation with Kyoto University and NIED for estimation of exhumation histories in geological time scale. At the present stage, the accuracy and precision are roughly 20 and 10%, respectively, using the age known zircon from the Fish Canyon Tuff (FC3). In the presentation, we will introduce the ages of some other age known samples.