# Thermochronology on the fore-arc side of Northeast Japan Arc

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An arc trench system is composed of a topographically high land and a trench along a subduction zone. An arc trench system is grouped into continental arc and island arc. The latter has a back-arc basin. Island arcs are tectonically active regions where a lot of volcanic activities and earthquakes occur, providing keys to solve the formation and evolution processes of orogenic zones and continents (Toriumi et al., 2018).

Northeast (NE) Japan is one of the best regions to study tectonics of island arc because NE Japan has comparatively obvious island arc components, i.e., fore-arc, volcanic front, back-arc and back-arc basin. Therefore, many studies have focused on the tectonic evolution of NE Japan (e.g. Amano and Sato, 1989; Sato, 1992; Nakajima, 2013). However, there are a few quantitative investigations of the mountain uplift and denudation histories which are important for estimating tectonics of island arcs.

For measuring uplift or denudation rates, some techniques are available (e.g., GPS survey, elevation of terraces, and thermochronology). To estimate million-year-scale mountain uplift and denudation rates, thermochronology is among the most appropriate methods. Thermochronology can reconstruct the time-temperature relationship of rock/mineral samples, based on radiometric ages and closure temperatures specific to the combination of radiometric dating methods and target minerals. Furthermore, some assumptions enable discussion of mountain uplift and denudation histories. Although thermochronology has been successfully applied to orogens worldwide (Hermam et al., 2013), a small number of thermochronometric studies have been attempted in NE Japan (e.g. Sueoka et al., 2017, Fukuda et al., in press). Moreover, these previous studies focused on the denudation histories of the across-arc scale rather than individual geologic component, namely fore-arc, Ou backbone range and back-arc.

In this study, we focus on fore-arc side of NE Japan, i.e., Kitakami Mountains and Abukuma Mountains, at which granitic rocks are distributed extensively, providing preferable study areas to apply thermochronology. We adopted apatite fission-track (AFT), apatite (U-Th-Sm)/He (AHe) and zircon (Zr) U-Pb analyses. AFT ages were estimated at 66.8-39.1 Ma in Kitakami and 61.0-40.5 Ma in Abukuma. AHe ages were obtained at 51.2-36.1 Ma in Kitakami and 75.9-60.1 Ma in Abukuma. Zr U-Pb ages were calculated at 110.3-104.3 Ma in Abukuma. With our results and the ages obtained by the previous studies, we discuss age trend and denudation history.

In Kitakami Mountains, AFT ages become younger to the east. On the other hand, all AHe ages are approximately comparable with each other except for the oldest age obtained at the westernmost locality. In Abukuma Mountains, both AFT and AHe age trends change across Hatagawa fault zone (HFZ); the ages were younger at the west side of HFZ than at the east side. Assuming that geothermal gradient is uniform at all localities, westerly tilting uplift and subsequent change of the uplift style were suggested in Kitakami Mountains. In Abukuma Mountains, our age data can constrain the faulting history of HFZ.

 

As future subjects, we are planning to conduct 1) improvement of accuracy and precision by further analyzing, 2) increasing number of sampling localities and employing other methods (e.g., cosmogenic nuclides analysis and ESR thermochronology), 3) applying thermal inverse modeling of AFT data to estimate more detailed thermal histories, 4) discussion of geothermal gradient, uplift model and tectonics model in Kitakami Mountains and Abukuma Mountains.

Acknowledgements: This study was carried out under a contract with METI (Ministry of Economy, Trade and Industry) as part of its R&D supporting program for developing geological disposal technology. This work was supported by the Grant-in-Aid for Scientific Research on Innovative Areas (KAKENHI No. 26109003) from the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Keywords: Thermochronology, Northeast Japan Arc, Abukuma, Kitakami

 