Denudation history of the Higher Himalayan Crystallines in West-Central Nepal: insights from zircon fission-track dating and thermokinematic modeling

*Nakajima Toru[1], Harutaka Sakai[1], Hideki Iwano[2], Tohru Danhara[2], Takafumi Hirata[3]

1. Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University, 2. Kyoto Fission-Track Co., Ltd., 3. Geochemical Research Center, The University of Tokyo

Zircon Fission-Track (FT) dating and thermochronological inverse calculation were used to indentify the denudation history of the Higher Himalayan Crystalline (HHC) in west-central Nepal. We newly obtained 17 zircon and 4 apatite FT ages from Higher Himalayan Crystallines (HHC), the overlying Tibetan Tethys Sediments (TTS) and the underlying Lesser Himalayan Sediments (LHS) along 80km long transect across the Himalaya.
The ZFT age from the underlyng sediments displayed northward younging linear distribution of the oldest age in the frontal part of the Lesser Hilamaya (13.4 ±1.0 Ma) to the youngest age in the root zone near the Main Central Thrust (1.5 ±0.2 Ma). On the other hand, the ZFT ages from the HHC and the overlying sediments ranged from 10.9 ±0.8 Ma to 1.7 ±0.4 Ma, and showed southward younging distribution. The ZFT age distribution along NNE-SSW transect displayed a concave upward pattern with the youngest FT age located near the Main Central Thrust (MCT). This distribution pattern is well corresponded to present uplift rate, indicating that the FT age distribution pattern reflects the tectonically driven exhumation.
Thermochronological invert calculation showed two rapid cooling (<100 ℃/Myr) phases of the HHC and the LHS in the late Miocene and the Pleistocene. With respect to this result, rapid exhumation is not only suggested in the Pleistocene, but also in the late Miocene. The former implies rapid exhumation of the HHC accompanied by reactivation of the MCT in the late Miocene, the latter implies rapid denudation accompanied by overthrusting of the hanging wall of the Main Himalayan Thrust (MHT).
Thermo-kinematic calculation results also suggest that the distribution of FT ages is well explained by exhumation process accompanied by the activity of the MHT. Furthermore, the kinematic model considering reactivation of the MCT in the late Miocene yields a better fit between predicted and observed ages than the model without reactivation, indicating agreement with reactivation of the MCT in late Miocene.

Keywords: Himalaya, thermochronology, fission-track age, denudation history, Higher Himalayan Crystallilne

