Tectono–thermal history of the Lesser Himalaya in eastern Nepal: Insights from multi-thermochronological study and thermo-kinematic modeling

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We investigated the cooling history of the Higher Himalayan Crystalline (HHC) and underlying Lesser Himalayan sediments (LHS) distributed in eastern Nepal. Previous studies reported that the cooling ages varied in space along an across-strike section in the Lesser Himalaya, and have proposed several thermo–kinematic models to explain the observed cooling age distribution. We carried out zircon and apatite fission–track (ZFT/AFT) dating and thermochronological invert calculation in order to constrain the time–temperature (t–T) path and determined the thermo–kinematic process by comparing the t–T path with the thermo–kinematic forward model. We newly obtained 18 ZFT ages and 11 AFT ages from the Higher Himalayan Crystalline (HHC) nappe and Lesser Himalayan sediments (LHS) distributed in eastern Nepal. The FT ages showed the northward-younging distribution pattern (ZFT: 10.7–4.8 Ma; AFT: 9.6–2.3 Ma) along the N-S section, which indicates the progressive northward cooling of the HHC and LHS since middle Miocene. Results of the thermochronological invert calculation revealed that the shape of the t–T path varies with its structural position and horizontal distance along the N-S section. Forward modeling using 2D thermo–kinematic model Pecube (Braun et al., 2012) demonstrated that the cooling age distribution and variety of the t–T path reflect two main tectono–thermal processes: 1) post-emplacement gradual cooling of the HHC nappe and 2) tectonically driven denudation associated with the activity of the Main Himalayan Thrust beneath the Himalaya. We suggest that these two processes mainly determine the tectono–thermal process of the Lesser Himalaya.

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