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LIST OF ABBREVIATIONS

^{208}Pb* = isotope corrected for common Pb
AVC = Atesina Volcanic Complex
BSE = Back-scattered electron
EDS = Energy dispersive X-ray spectrograph
CAP = Cima d'Asta Pluton
GHC = Greater Himalayan Crystallines
HHL = High Himalayan Leucogranites
LHF = Lesser Himalayan Formation
LPP = La Posta Pluton
MBT = Main Boundary Thrust
MCT = Main Central Thrust
MFT = Main Frontal Thrust
NHG = North Himalayan Granites
P-T = Pressure-temperature
P-T-t = Pressure-temperature-time
STDS = South Tibetan Detachment System

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ABSTRACT OF THE DISSERTATION

Geochronologic and Thermobarometric Constraints on the Evolution of the Main Central Thrust, Himalayan Orogen

by

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The Main Central Thrust (MCT), which juxtaposes high-grade Greater Himalayan Crystallines over the lower-grade Lesser Himalaya Formations, is the dominant crustal thickening structure of the Himalayan orogen. Initiation of MCT movement, the origin of footwall inverted metamorphism, and the relationship of the thrust with other geologic elements remains speculative. *In situ* Th-Pb monazite ages and thermobarometric information were obtained from rocks collected along four MCT transects (Bhagirathi River, NW India; Marysandi River and Darondi Khola, central Nepal; Dudh Kosi-Everest, eastern Nepal). An ion microprobe method to determine Th-Pb allanite ages with ±10% accuracy was developed to address geologic questions, including those from the Himalaya. The geochronologic data indicate a striking lateral continuity of tectonic events across the range. Early Miocene monazite inclusions are found in garnets immediately beneath the MCT, whereas Late Miocene/Pliocene ages characterize rocks from the apparent inverted metamorphic sequence. The youngest, more precise monazite age and growth conditions determined is 3.3±0.1 Ma [(1σ); P ~7.2 kbar, T ~535°C] from a central Nepal sample near the garnet isograd. The age indicates this portion of the MCT shear zone accommodated a minimum of ~30 km of slip over the last 3 Ma. Matrix monazites beneath the MCT in NW India yield an age of 5.9±0.2 Ma, supporting widespread Late Miocene MCT activity across the collision front. Pliocene ^{40}Ar/^{39}Ar muscovite ages from Darondi Khola rocks suggest rapid exhumation of the MCT shear zone. The absence of 7-3 Ma monazite ages in eastern Nepal may reflect a different nappe structure and one that obscures the reactivated ramp equivalent exposed elsewhere. Garnets from the MCT hanging wall and footwall display unique major element zoning, useful in constraining the location of the MCT thrust system that is otherwise difficult to discern. MCT footwall rocks in central Nepal show apparent inverted thermal and pressure gradients of ~18°C/km and ~6 km/kbar. P-T paths estimated for Lesser Himalaya samples in central and eastern Nepal indicate the presence of a previously unseen structural break. Geochronologic and thermobarometric data from these transects support a model in which the inverted metamorphism underlying the MCT formed by the transposition of right-way-up metamorphic sequences during Late Miocene/Pliocene shearing.