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Detrital zircon micro-geochronology across the Main Central Thrust (MCT), Uttarakhand Himalaya: Implications for Lesser Himalaya and Higher Himalayan terrane characterization.

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Highly deformed, multiply imbricated and variably sheared mylonitic/phyllonitic rocks of the Munshiari formation, also called as the MCT zone (MCTZ), is bounded by the Munshiari Thrust at its base, and the Vaikrita Thrust (VT) along its upper margin. These mark the boundary between the domains of Higher Himalayan (HHC) and Lesser Himalayan Sequences (LHS). However, exact position of the MCT remained a matter of debate. Recent investigations revealed a contrasting ε_{Nd} pattern across the Vaikrita thrust with more negative values (-2 to -16) characterizing the LHS than the HHC (-12 to -19; [1]). Distribution of detrital zircon dates are also found to be markedly different with younger ages for the HHC (1050-600Ma) while older ages for the LHS zircons (>1550; [2] & [3]). On this account the rocks of the MCTZ (Munshiari Fm) were found akin to the LHS, while VT thus represents a major terrain boundary and was preferred as the actual MCT. In this study we examined detrital U-Pb zircon micro-geochronology of two litho-units (Berinag Quartzite and Munshiari augen gneiss) to the south and two lithounits (Joshimath and Suraithota Fm) to the north of across the MCT (or the Vikrita thrust) to better constrain the terrane boundary.

The results of our study on zircon U-Pb micro-geochronology reveal interesting patterns and characteristics. Zircons from the Berinag quartzite of LHS in proximity of the MCTZ gives scattered discordant upper intercept ages ranging from 1800 to 2050 Ma with minor older inherited Archaean-Early Proterozoic components (2400-2600 Ma). The overlying MCTZ (Munshiari Fm) contains two tightly clustered Paleo-Proterozoic intercept age at 1945±13 Ma and a second one at 1850±8 Ma with a common lower intercept of 27.9±8 Ma. More than 120 zircon grains from 6 samples were measured, but no Archean-Early Proterozoic component was observed in this unit. At the base of the HHC (Joshimath Formation), first appearance of Neoproterozoic zircons (870±13 Ma) were noted across the MCT (the Vaikrita Thrust) with a minor component of older inherited zircons cores of 2629±10 Ma. Notably the Paleo-Proterozoic dates are conspicuously missing in this unit. Further north within HHC in the Suraithota Fm. (≡ Pandukeswer Fm.), the Neoproterozoic zircons predominate among the three clusters at 950-850 Ma (Intercept age 870±9), 1700-1900 (intercept age ~1850 Ma) and a minor Archean-Early Proterozoic component (~2550 Ma).

The above results clearly demonstrate a gradual shift in provenance of zircons influx in different lithounits in the proximity of MCT. First appearance of the Neoproterozoic zircons across VT besides much older components typify and distinguish the HHC from the LHS terrane in more clear terms in addition to the Nd isotopic signatures suggesting a major terrane boundary. The older zircons of Paleoproterozoic and Archean-early Proterozoic do occur at least in the lower units of HHC. The MCTZ

(Munshiari Fm) is characterized by a single population of Paleoproterozoic zircon population with a distinct event of Pb loss at 27.9±8 Ma. In absence of any other possible thermal event, this lead loss probably corresponds to the age of peak deformation activity along the MCT where sufficient shear heat is expected to be generated in such regional scale thrust movement.

References:

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