Isotopic constraints on the characteristics and provenance of the Main Central Thrust zone in the far-eastern Nepal

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The Himalaya is a fold-and-thrust belt in the northern margin of the Indian continent with a foreland-propagating thrust system. Among these thrusts the Main Central Thrust (MCT)zone is the most important in the Himalayan tectonics, and is a ductile-brittle zone of less 1km to several km in thickness. Along the MCT zone the non- to less-metamorphic rocks of the Lesser Himalaya are overlain by the high-grade metamorphic rocks of the Higher Himalaya. The upper boundary of MCT zone is known as the Upper MCT (UMCT) and the lower one as the Lower MCT (LMCT). The lithology of the MCT zone is characterized by mylonitic augen gneiss, biotite-muscovite-chlorite phyllite with S-shaped garnet and graphitic phyllite. Texture, compositions and zoning patterns of garnets can be discriminated between the MCT zone and the Higher Himalaya. Paudel and Arita (2002) have concluded that the MCT zone belongs to the footwall with regard to the lithology.

The far-eastern Nepal can be devided into three tectonic units: the Higher Himalaya, the Lesser Himalaya and the Sub-Himalaya. The Higher Himalaya is composed mainly of kyanite-sillimanite gneisses and granitic gneisses. The Lesser Himalaya comprises metaquartzite, slate, metagraywacke and impure marble. The Sub-Himalayan zone consists of the molasses sediments. The UMCT dips 30 to 50 to northeast and is subparallel to the foliations Higher Himalayan gneissic foliations and the Lesser Himalayan rocks.

Information on the tectonic disposition of the geologic units juxtaposed by the MCT prior to the Himalayan orogeny is important for understanding the crustal shorting and changes of thermal structure due to the MCT activity. In general, the Higher Himalayan sequence has been considered to be Indian basement in origin, and the Lesser Himalayan sequence has been deposited on the northern margin of the Indian continent. However, the Higher Himalayan sequence in the Langtang area, central Nepal yields zircon U-Pb ages of 0.8 to 1.0 Ga, implying a sedimentary provenance of the Late Proterozoic. On the other hand, the Lesser Himalayan sequence contains 1.87 to 2.60 Ga zircons. Therefore, it was proposed that the Higher Himalayan sequence is metasedimentary rocks that were originally deposited north of continental margin than the Lesser Himalayan sequence (Parrish and Hodges, 1996). Furthermore, Nd isotope data are useful in distinguishing between Higher Himalayan and Lesser Himalayan zones (Ahmad et al., 2000). These data show that the epsiron Nd(0) values in the Higher Himalayan are -19 to -5, whereas the Lesser Himalayan has epsiron Nd(0) values of -28 to -15. In addition, Sr isotope data also has a similar trend. These date are agreement with a major tectonic feature of the UMCT.

In the presented study area the epsiron Nd(0) values from rocks of the Higher Himalaya and the Lesser Himalaya are almost within the range of the previous data. Theepsiron Nd(0) values obtained are -18 to -10 in the Higher Himalaya and -24 to -27 in the Lesser Himalaya. However, most samples from the MCT zone have the middle epsiron Nd(0) values(-19 to -23) of the samples from Higher Himalaya and Lesser Himalayan. No previous Nd isotopic studies almost have been conducted in the MCT zone. Given that Parrish and Hodges (1996) is correct, these data might suggest that the rocks of the MCT zone occupied the northern part of Indian continent in which Lesser Himalayan zone were deposited or that the LMCT was an important tectonic thrust rather than the UMCT.

Reference

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