Tertiary U-Pb Zircon Ages and Lower Paleozoic Signatures from Leucosomes of the Namche Migmatites, Everest Area, Nepal Himalaya

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Following Bordet (1961) and Lombardo and others (1993), from south to north, the Higher Himalayan Crystallines (HHC) of the Everest area can be broadly divided into: (1) Barun Gneiss, (2) Namche Migmatitic Orthogneiss and (3) Black gneiss. In this work, leucosome samples were collected for dating from two horizons of Namche migmatites – the lower one from a location about 1 km north of Phakdin Village lying on the left bank of the Dudhkoshi river (Sample No. 07EVT3). Another sample was collected from a stream east of Khumjun Village that lies to the north of Namche Bazaar (Sample No U1206). The Namche migmatite is a rock unit with upper amphibolite-granulite facies metamorphism and mainly composed of interlayered migmatitic ortho- to paragneisses with profusely developed leucosomes, biotite-sillimanite quartzo-feldspathic gneiss and minor calcsilicate rocks. These rocks were formed at high temperature (c. 700^0C) and at pressure of <5 kbar (Searle and others, 2003). A number of larger concordant bodies of Miocene leucogranites such as the Nuptse granite and granitic dyke networks intrude the overlying Black gneisses.

U-Pb geochronology of zircons was conducted by laser ablation-multicollector-inductively coupled plasma-mass spectrometry (LA-MC-ICP-MS) at the University of Arizona. The Concordia diagrams are shown in Figures 1A and 2A. Six overlapping analyses of the zircon grain from the leucosome sample No. 07EVT3 yielded an age of 20.9 ± 1.2 Ma (2σ) with early Paleozoic cores (Figure 1B). Similarly, the 12 overlapping analyses from Sample No. U1206 yielded the age of 24.8 ± 0.5 Ma (2σ) again with an older core (Figure 2B); bracketing the age of anatexis of the Namche Migmatites between 20.9 and 24.8 Ma. These data provide the age range of the peak Tertiary metamorphism in the Everest region. The data are comparable with the monazite and xenotime ^{207}U/^{235}Pb ages (25.4±0.11 and 22.11±0.22 Ma) reported by Viskupic and Hodges (2001) from the same area.

The analyzed zircon grains clearly show the inheritance of early Paleozoic cores surrounded by the Tertiary rims. Sample 07EVT3 shows the core age of 478±25 Ma whereas sample U1206 has a 515±20 Ma old core. Although a direct evidence of the origin of these relict zircon cores are not available, it is reasonable to infer that these grains may have derived from the granitoid protoliths of the Namche migmatites rather than representing the detrital grains from metasediments. This assumption further implies that these relict zircon grains must have formed during the Lower Paleozoic Pan-African orogeny producing the protoliths- granites and gneisses which in turn metamorphosed to produce, gneisses, migmatites and leucogranites during the much younger Himalayan orogeny during the Tertiary period. Thus, the Lower Paleozoic metamorphism during the Pan African orogeny seems to be nearly as strong as the Tertiary Himalayan orogeny to produce anatectic melts generating granites and migmatites. This interpretation confirms with the similar conclusions made by Gehrels et al. (2006a,b) for the Kathmandu and Dadeldhura thrust sheets in central and far western Nepal and Tonarini et al. (1994) and Pognante and Benna, (1993) for Everest-Makalu region. The high U/Th ratio (Fig. 3) found in the young Tertiary as well as the Lower Paleozoic zircons suggests that they grew in the presence of abundant metamorphic fluids.

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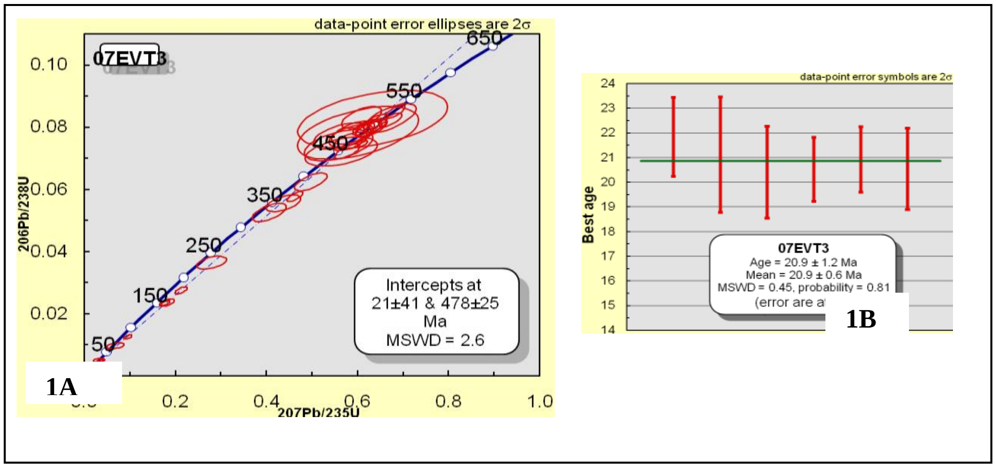

Figure 1A. Pb/U Concordia diagram of zircon analyses from north of Phakding Village Sample No. 07EVT3). **1B**: The weighted mean $^{206}Pb/^{238}U$ age of the concordant analyses is 20.9±0.6 Ma. MSWD - mean square of weighted derivatives.

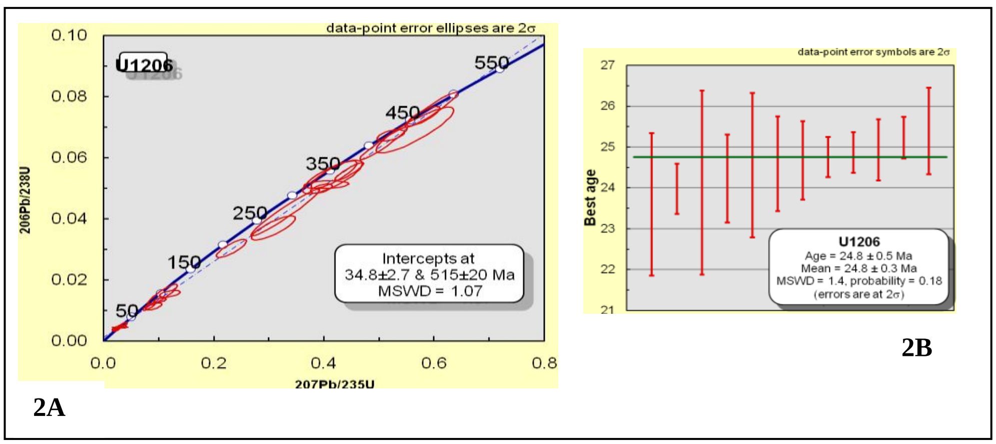

Figure 2A. Pb/U Concordia diagram of zircon analyses from east of Khumjun Village (Sample No. U1206). **2B:** The weighted mean $^{206}Pb/^{238}U$ age of the concordant analyses is 24.8±0.3 Ma. MSWD- mean square of weighted derivatives.

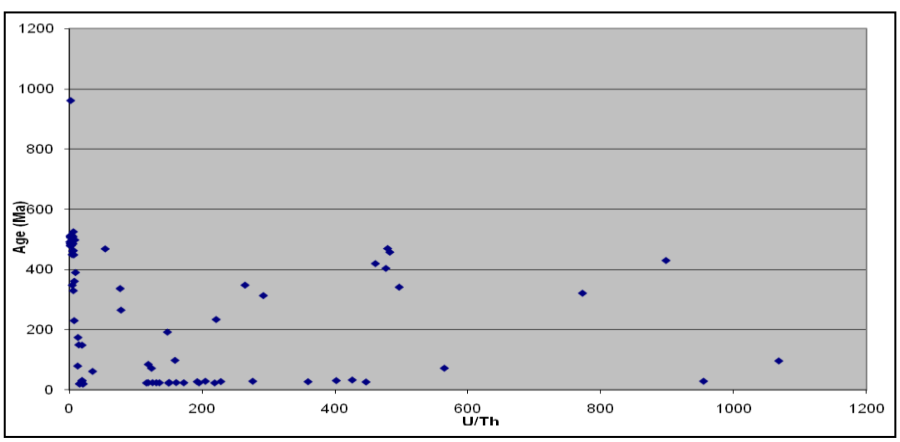

Figure 3. U/Th plot of the zircon samples

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