Geophysical Research Abstracts
Vol. 12, EGU2010-9040, 2010
EGU General Assembly 2010

Recent exhumational pattern across the Lhasa Terrain: Revealed by detrital zircon fission track and U/Pb ages from modern fluvial sediments along Yarlung-Tsangpo, South Tibet

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Detrital samples from the foreland basin and so forth depositional environments archive the evolutional phases of adjacent orogens. Modern fluvial sediments, similarly, provide the integrated information of exposed bedrocks in the studied drainages where sometimes few access is allowed to get the in situ samples. However, the nature of the dispersed detrital ages has long hampered our interpretation in thermal evolution and surface processes of the studied terrain, mainly spatial-wise. With suitable thermo-chronometers, multiple dated single-grain ages can shed a light on the provenance of studied grains and limit the uncertainties of plausible source areas.

In this study, we present the detrital zircon fission track (ZFT) and U/Pb ages from the modern fluvial sediments collected along the Yarlung-Tsangpo and its two tributaries, Lhasa River and Nyang River. The sample collected from Lhasa River (LS) shows its ZFT age population peaks as: 1.5 Ma (2.1%), 6.8 Ma (44.5%), 11.3 Ma (34.1%), and 32.5 Ma (19.3%) while the sample collected from Nyang River (BY) shows the age peaks as: 6.2 Ma (10.3%), 22.8 Ma (36.3%), and 51.6 Ma (53.4%). The ZFT ages are much younger than the bedrock strata of Lhasa terrain (Proterozoic to Mesozoic) and most of the intrusive Gangdese belt (Mesozoic to Mid-Miocene). So far, our U/Pb ages from LS has corresponded to published Gangdese intrusion ages and further confirm that the majority of analyzed grains exhibit consistent young ZFT ages, indicating a significant exhumational phase in the Lhasa Terrain from 15-6 Ma.

However, the occurrence of this recent exhumation may not be contemporary and the magnitude must be diverse across the Lhasa Terrain. Evidently, we observe a dramatic decrease of younger ZFT age population (grain ages younger than 15 Ma) descending from $\sim$78% in the Lhasa River drainage down to less than 15% in the Nyang River drainage. On the other hand, the older population (grain ages > 15 Ma) shifts from $\sim$20% (Lhasa River) to $\sim$85% (Nyang River). This significant discrepancy of age population suggests that the two drainages could have undergone different scenarios of exhumation.

In short, detrital ZFT and U/Pb single grain ages in this study present a clear picture of recent exhumation around 15-6 Ma in the SE Lhasa Terrain. The span and magnitude of exhumation appear to be discordant across the Lhasa Terrain. With more knowledge of the in situ ages from exposed bedrocks and more densely monitored samples in studied catchments, our future step is to map the discrepancy of age population which reflects the recent denudation signals and to further estimate the contribution of potential sources.