



Extreme uplift and erosion rates in eastern Himalayas (Siang-Brahmaputra basin) revealed by detrital (U-Th)/He thermochronology

R. Pik, C. France-Lanord and J. Carignan
CRPG-CNRS, France, rpik@crpg.cnrs-nancy.fr

The distribution of erosion intensity in a major mountain range such as the Himalaya is a fundamental clue to investigate the interaction between climatic, tectonic and erosion processes that govern the morphology and evolution of an orogen. At the first order, the sediment flux measured on the two major rivers - Ganga and Brahmaputra - suggest higher mean denudation rates for the Eastern Himalaya than Western Himalaya (Galy and France-Lanord, 2001). However, the distribution of erosion in the Brahmaputra basin is not uniform and the Namche Barwa area, drained by the Siang-Tsangpo, appears to supply up to 50% of the total sediment flux of the Brahmaputra (Singh and France-Lanord, 2002).

In order to further constrain the relationships between such localized erosion and the associated exhumation rate of basement, we measured (U-Th)/He ages in detrital zircons from river sediments in the Brahmaputra basin. This thermochronological system (Z-He) is particularly interesting for detrital material because: (i) zircon is preserved during weathering and erosion processes, (ii) its closure temperature (150-180°C, Reiners et al., 2004) corresponds to a depth which is close to the surface but deep enough to avoid perturbations by topography variations, and (iii) the error associated to single grain measurement (8-10 %) allows a good definition of population ages.

Z-He ages from the Brahmaputra river in Bangladesh range from 0.4 to 77 Ma. 40% of the zircon population exhibit Z-He ages between 0.4 and 1 Ma defining the major distribution peak centred at 0.5 Ma. These very young ages correspond to extreme denudation rates of 5 to 7 mm/yr. Dispersed Z-He ages from 12 to 77 Ma do not define any population groups, whereas the remaining 40% of the zircons have ages

distributed between 2.5 and 7 Ma, which correspond to the pool of ages recorded by preliminary Z-He ages on the other Himalayan rivers of the basin. Therefore, such very high denudation rates (5-7 mm/yr) seems to characterize the Brahmaputra itself. This result is in complete agreement with the isotopic geochemical budget of the rivers, and indicate that the 50 % of the detrital flux supplied by the Siang-Tsangpo system is characterized by very young Z-He ages originating from a very high-denudation rate area. These results are also in agreement with the Fission track data measured upstream in the Namche Barwa syntaxis which exhibit the same type of very young zircon ages (Stewart et al., 2004). These complementary results confirm that sediments originating from this part of eastern Himalaya, associated with extreme erosion rates, dominate the sedimentary budget of the Brahmaputra basin.

Galy and France-Lanord, 2001, *Geology*, 29, 23-26

Singh and France-Lanord, 2002, *EPSL*, 252, 645-662

Reiners et al., 2004, *GCA*, 68, 1857-1887

Stewart et al., 2004, Fall AGU abst. , T53A-0471