



Characterisation of the evolution of a foreland basin active margin from sedimentary record and AFT analysis on detrital apatite: example of the NE Tian Shan foothills.

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The general aim of the present study is to assess how the sediments deposited in the foothills record the development (exhumation and erosion) of a range.

The current high relief topography of the Tien Shan range is mostly related to the Tertiary reactivation of the range. The Northeastern Tien Shan foothills present unique conditions of preservation and exposure of the sedimentary series (cylinder-shaped foothills, continuous series from Triassic to Holocene). The Tertiary sediments corresponding to the last orogenic period are continuously exposed in two sections (Jingou He and Kuitun He). Both are entirely constrained by magnetostratigraphical studies [1]. We analysed the series (in terms of facies, deposition environment, paleocurrents direction, and petrological composition) over two several kilometers long sections. The sedimentary environments evolve through time and space between anoxic lakes and braided alluvial fans. Contemporaneously, the orientation of the paleocurrent directions shift from E-W to N-S. This evolution is diachronous from E to W over the two sections.

Preliminary work by Dumitru et al. (2001) [2] showed that Tertiary sediments are not thermally reseted. Detrital Apatite Fission Track analysis (AFT) performed on selected samples along the sections provide indication about the amount of erosion in the range, the evolution of the sediment sources and finely the recycling of sediments within the sedimentary. Five age groups are defined from AFT: > 200 Ma, 200 - 150 Ma, 150 - 50 Ma, 50-40 Ma and < 40 Ma. They also correspond to major events in the history of the range (Mesozoic reactivation between 200 and 150 Ma; Low tectonic activity and peneplanation of the relief between 150 and 50 Ma; Onset of the India-Asia collision between 50 and 40 Ma; Ongoing deformation phase since 40 Ma) [3].

AFT ages corresponding to the final (<40 Ma) age class appear in the sediments between 6.7 and 5.4 Ma immediately prior the major environmental change between the Dushanze alluvial plain and the Xiyu alluvial fan. This correlation must be interpreted in terms of proximity of the source area (avoiding mixing between the newly eroded "young" apatites and older, recycled crystals), maturity of the relief (the exhumation in the range is sufficient to exposed completely reset sources) and/or increase of the erosion rate in the source area. However, no or only few ages corresponding to the supposed age of the topography (ca. 10 Ma, [1]) are found indicating that exhumation in the range is still not sufficient to expose large portions of completely reset sources.

The constant occurrence of a large proportion of AFT ages within the 50 - 150 Ma and older classes demonstrates while some old sources may still be preserved in the range [3], sediment recycling inside the foothills series must be strong. This should be taken into account when translating sedimentation rates into erosion rates at the source.

[1] Charreau et al., (2005), *Earth and Planetary Science Letters* 230, 177-192.

Charreau et al., (2009), *Tectonics* 28, TC2008, doi:10.1029/2007TC002137.

[2] Dumitru et al., (2001), *Geological Society of America Memoir*, 194, 71-99.

[3] Jolivet et al., (2010), *Tectonics* 29, TC6019, doi:10.1029/2010TC002712.