



## **Mass balance from alluvial fan isopachs: a case study from the Chinese Tian Shan**

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Continental surfaces are incessantly reworked through erosion and sedimentation. Markers of erosion within drainage areas are often scarce and temporary, but at the outlet of mountain belts, more continuous and perennial records of deposition can be found in alluvial fans. These fans are constructed by the deposition through time of the coarse part of sediments transported by rivers. Volume of sediments trapped in alluvial fans can then be used in order to reconstruct sediment fluxes coming out from their catchment areas and the associated erosion rates. Quantifying such erosion rates is of great interest for the study of mass transfer. It is also necessary to understand relief dynamics, as well as the influence of tectonic and climate on this dynamics.

We propose here a complete method to estimate erosion fluxes from alluvial fans in a specific area, the northern piedmont of the Tian Shan in China. Along the piedmont of this range, series of fans of different ages are clearly identified. In particular, abandoned fans (which were active before 10 000 years ago) are well preserved in the landscape, and easily identifiable on satellite images. These fans have been deeply incised during the last deglaciation (about 10 000 years ago), and therefore, their basal surface can be observed. In this specific area, it is then possible to obtain field constraints on the real fan thickness. First, we draw a morpho-sedimentary map of the fans and their drainage basins. Then, we went on the field to estimate the fan thickness wherever it is possible. Finally, based on this data set, and on geometrical considerations, we built isopach maps of the fans and calculate their volumes. These 3D reconstructions can then be compared to the geometrical relationships classically used to assess alluvial fan volumes from their upper surface only.

Erosion rates of ten drainage basins can be derived from these volumes, allowing a sink to source investigation, for the period of fan activity. In north Tian Shan, these erosion rates can be compared with other values calculated from bedload measurements and cosmogenic data, providing thus an opportunity to discuss results coming from different methods