



Seasonal mass balance of sediment transport along the upper Urumqi River in Tianshan

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Measurements were performed during two complete flow seasons on the Urumqi River, a proglacial mountain stream in the northeastern flank of the Tianshan, an active mountain range in Central Asia. This survey of flow dynamics and sediment transport (dissolved, suspended and bed loads), together with a 25-year record of daily discharge, enables the assessment of secular denudation rates on this high mountain catchment of Central Asia. Our results show that chemical weathering accounts for more than one-third of the total denudation rate. Sediment transported as bed load cannot be neglected in the balance, given that sand and gravel transport accounts for one third of the solid load of the river. Overall, the mean denudation rates are low, averaging $46 \text{ t} \times \text{km}^{-2} \times \text{yr}^{-1}$ ($17\text{--}18 \text{ m Myr}^{-1}$). We furthermore analyse the hydrologic record to show that the long-term sediment budget is not dominated by extreme and rare events but by the total amount of rainfall or annual runoff. The rates we obtain are in agreement with rates obtained from the mass balance reconstruction of the Plio-Quaternary gravely deposits of the foreland but significantly lower than the rates recently obtained from cosmogenic dating of the Kuitun River sands, west of the Urumqi River. We show that the resolution of this incompatibility may have an important consequence for our understanding of the interplay between erosion and tectonics in the semi-humid ranges of Central Asia.