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Time-scale dependent sediment flux in the Tajik Pamir Mountains

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The Pamir Mountains (Pamirs) offer the unique possibility to observe landscape shaping processes in a complex climatic environment. While the Westerlies provide most of the moisture as snow in winter, the Indian summer monsoon can also contribute quite significantly to the water budget in summer. Water from snow and ice melt induced by temperature and rainfall mobilizes sediments from hillslopes, debris fans, and moraine remnants. These sediments are transported, re-deposited, and eventually carried out of the orogene. Different approaches are available to assess and quantify the erosion processes at different time-scales. Recent studies applying cosmogenic nuclide (CN) dating suggest erosion rates of approximately 0.65mm/yr for the last 1000 years.

In this contribution we want to present modern erosion rates derived from historical archive suspended sediment yield (SSY) data and very recent in situ sampling data, including high-resolution turbidimeter measurements. 10-day averaged SSY data recorded in the past show less erosion by a factor of 2 to 10 compared to CN-derived erosion rates for different catchments. The 10-day SSY data are based on measurements that have been conducted in the morning and evening, thus not accounting for the entire diurnal variation. We installed a turbidimeter with a measuring interval of 10 minutes to better resolve these diurnal variations. We calibrate turbidity with in situ measurements carried out on a daily basis for 9 months to see whether the differences between CN and SSY measurements are really owed to diurnal variations or if rare high magnitude events. e.g. mudflows, landslides, or avalanches disclose this discrepancy.

We present single high magnitude SSY events, uncover periodic diurnal sediment variations that systematically lag diurnal temperature variations and relate the sediment amount of such high magnitude events to the smoothed annual cycle. We use the obtained results to discuss whether past changes in climate could explain the observed difference between millennial scale CN vs decadal scale SSY measurements or if single high magnitude events must play the dominant role.