Geophysical Research Abstracts
Vol. 16, EGU2014-6199, 2014
EGU General Assembly 2014

Sediment transport patterns and climate change: the downstream Tuul River case study, Northern Mongolia.

Jan Pietroń and Jerker Jarsjö
Stockholm Univeristy, Dept. Physical Geography and Quaternary Geology, Stockholm, Sweden (jan.pietron@natgeo.su.se)

Ongoing changes in the Central Asian climate including increasing temperatures can influence the hydrological regimes of rivers and the waterborne transport of sediments. Changes in the latter, especially in combination with adverse human activities, may severely impact water quality and aquatic ecosystems. However, waterborne transport of sediments is a result of complex processes and varies considerably between, and even within, river systems. There is therefore a need to increase our general knowledge about sediment transport under changing climate conditions.
The Tuul River, the case site of this study, is located in the upper part of the basin of the Selenga River that is the main tributary to Lake Baikal, a UNESCO World Heritage Site. Like many other rivers located in the steppes of Northern Mongolia, the Tuul River is characterized by a hydrological regime that is not disturbed by engineered structures such as reservoirs and dams. However, the water quality of the downstream Tuul River is increasingly affected by adverse human activities – including placer gold mining. The largest contribution to the annual river discharge occurs during the relatively warm period in May to August. Typically, there are numerous rainfall events during this period that cause considerable river flow peaks. Parallel work has furthermore shown that due to climate change, the daily variability of discharge and numbers of peak flow events in the Tuul River Basin has increased during the past 60 years. This trend is expected to continue.
We here aim at increasing our understanding of future sediment transport patterns in the Tuul River, specifically considering the scenario that peak flow events may become more frequent due to climate change. We use a one-dimensional sediment transport model of the downstream reach of the river to simulate natural patterns of sediment transport for a recent hydrological year. In general, the results show that sediment transport varies considerably spatially and temporally. Peak flow events during the warm period contribute largely to the total annual transport of sediments and also to the erosion of stored bed material. These results suggest that if the number of peak flow events will increase further due to climate change, there will be a significant increase in the annual sediment load and consequently in the load of contaminants that are attached to the sediments, in particular downstream of mining sites. The present results are furthermore consistent with parallel studies on sediment transport and climate change showing that increased water discharges and frequencies of rainfall/flow events can lead to enhanced erosion processes. Furthermore, in addition to climate change effects, human activates can change sediment loads in rivers to even greater extent, as pointed out in several studies. Thus, several different challenges can be expected to face the management of Central Asian rivers such as Tuul and their ecosystems in the future.