



Integrated observation and modelling of runoff and sediments across different compartments of semi-arid catchments and channel networks

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About one-third of the global population currently lives in countries which experience conditions of water stress. Such regions, often located within dryland ecosystems, are exposed to the hazard that the available freshwater resources fail to meet the water demand in domestic, agricultural and industrial sectors. Water availability often relies on the retention of river runoff in artificial lakes and reservoirs. However, the water storage in reservoirs is often adversely affected by sedimentation as a result of soil erosion. Erosion of the land surface due to natural or anthropogenic reasons and deposition of the eroded material in reservoirs threatens the reliability of reservoirs as a source of water supply. To sustain future water supply, a quantification of the sediment export from large dryland catchments becomes indispensable.

A comprehensive modelling framework for water and sediment transport at the meso-scale, with a particular focus on dryland regions, has been developed from a German, Catalanian and Brazilian team during the last decade. It includes novel components for erosion from erosion-prone hillslopes, sediment transfer, retention and re-mobilization through the river system and sediment distribution, trapping and transfer through a reservoir. The parameterisation for pilot catchments is based on field monitoring campaigns of water and sediment fluxes, the analysis of land-use patterns, and the identification of the sediment hot spots through remotely sensed data. We present results of erosion-prone landscape units, the role of sediment transport in the river system, and the sedimentation processes in reservoirs. The modelling studies demonstrate the wide range of environmental problems where the model may be employed to develop sustainable management strategies for land and water resources. Evaluation of scenarios (land use, climate change) combined with an integrated assessment of options in reservoir management opens the opportunity to address relevant questions of water management including problems of water yield, reservoir capacity and economical comparison of on-/ offsite sediment management.