



Measurements, Fingerprint, Modeling - Compiling a sediment budget in a data scarce catchment in NW Jordan

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In regard to the quantitative and qualitative water problems in Jordan the soil layer and its physical integrity is important to slow down runoff, guarantee infiltration, and a sensible parameter in terms of hydrologic modeling. Erosion harms this potential and needs to be better understood and quantified in the region.

Therefore, a multiple response approach was implemented to compile a sediment budget for the research area Wadi Al-Arab in the NW of Jordan (263,5km²). The climate is Mediterranean to semi-arid with <300 to 550mm of rain in winter. Mainly marl and limestone of the Upper Cretaceous and the Paleocene make up the catchment's geology. The area is characterized by an agricultural basin in the east and an increase in relief energy to the west and south.

Different field measurements were implemented on relevant sediment sources, such as olive orchards, agricultural fields, natural vegetated slopes and exposed rock with patchy vegetation as well as the Wadi Al Arab Dam Lake as the final sink. The focus involved the quantification of the yearly sediment yields and the deposition in the lake, respectively. In a second step a multiple sediment fingerprint was applied including the geochemical differentiation of the sources with inorganic elements and radio nuclides. The relative importance of each source could be calculated on the basis of lake sediment samples.

Results of these two approaches cover different spatial scales and only partly integrate the transport way. Hence, they cannot be directly compared but consider the problem from different perspectives and are used in the final step to calibrate and validate the setup of the SedNet model (Wilkinson et al. 2008) for the catchment. The model offers the possibility to incorporate additional raster information, includes additional sources such as gully and bank erosion, and takes account for different areas of deposition according to the measured and regionalized discharge in the region. Its' implementation helped to test the field findings to their limits and provides a more holistic sediment budget for Wadi Al-Arab.

Reference:

Wilkinson, S., Henderson, A., Chen, Y., Sherman, B. (2008): SedNet User Guide. Client Report, CSIRO Land and Water; Canberra.