



Reconstruction of the sediment flow regime in a semi-arid Mediterranean catchment using check dam sediment information.

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When using hydrological and sedimentological models, lack of historical records is often one of the main problems to face, since observed data are essential for model validation. If gauged data are poor or absent, a source of additional proxy data may be the slack-water deposits accumulated in check dams. The aim of this work is to present the result of the reconstruction of the recent hydrological and sediment yield regime of a semi-arid Mediterranean catchment (Rambla del Poyo, Spain, 184 square km) by coupling palaeoflood techniques with a distributed hydrological and sediment cycle model, using as proxy data the sandy slack-water deposits accumulated upstream a small check dam (reservoir volume 2,500 square m) located in the headwater basin (drainage area 13 square km).

The solid volume trapped into the reservoir has been estimated using differential GPS data and an interpolation technique. Afterwards, the total solid volume has been disaggregated into various layers (flood units), by means of a stratigraphical description of a depositional sequence in a 3.5 m trench made across the reservoir sediment deposit, taking care of identifying all flood units; the separation between flood units is indicated by a break in deposition. The sedimentary sequence shows evidence of 15 flood events that occurred after the dam construction (early '90). Not all events until the present are included; for the last ones, the stream velocity and energy conditions for generating slack-water deposits were not fulfilled due to the reservoir filling.

The volume of each flood unit has been estimated making the hypothesis that layers have a simple pyramidal shape (or wedge); every volume represents an estimation of the sediments trapped into the reservoir corresponding to each flood event.

The obtained results have been compared with the results of modeling a 20 year time series (1990 – 2009) with the distributed conceptual hydrological and sediment yield model TETIS-SED, in order to assign a date to every flood unit. The TETIS-SED model provides the sediment yield series divided into textural fractions (sand, silt and clay). In order to determine the amount of sediments trapped into the ponds, trap efficiency of each check dam is computed by using the STEP model (Sediment Trap Efficiency model for small Ponds, Verstraeten and Poesen, 2001). Sediment dry bulk density is calculated according to Lane and Koelzer (1943) formulae.

In order to improve the reliability of the flood reconstruction, distributed historical fire data has also been used for dating carbon layers found in the depositional sequence. Finally, a date has been assigned to every flood unit, corresponding to an extreme rainfall event; the result is a sediment volume series from 1990 to 2009, which may be very helpful for validating both hydrological and sediment yield models and can improve our understanding on erosion and sediment yield in this catchment.