# Mapping riverbed conditions at the drainage-network scale in the Perales river basin (Spain)

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## Introduction

Sediment transport controls channel morphology. At the river reach scale, the balance between sediment inputs and outputs of the reach determines whether the channel is in 'equilibrium' or is experiencing aggradation or erosion.

Knowledge of these sediment budgets at the reach scale is of interest for many management issues. River managers often demand catchment-scale characterisations of sediment balances, as this type of information can help them to prioritise those river reaches where restoration or further actions are required.

We propose a relatively simple, fast method for producing catchment-based maps of sediment budgets of the different segments of a river network, based on commonly used Geographical Information System (GIS) tools.

## Rationale

According to the simplified version of the 1D sediment continuity equation, volume changes in sediment storages ($\Delta V$) in a river reach can be linked to sediment inputs ($q_{s,i-1}$) and sediment outputs ($q_{s,i}$):

$$\Delta V = q_{s,i-1} - q_{s,i}$$

From this expression, we could derive the following metric:

$$\Delta nV_i = \frac{q_{s,i-1} - q_{s,i}}{min(q_{s,i}, q_{s,i-1})}$$

which would be close to 0 if the reach is in equilibrium, greater than 0 if it is aggrading and less than 0 if it is in incision.

$$q_s \approx f(D, S, Q, B)$$

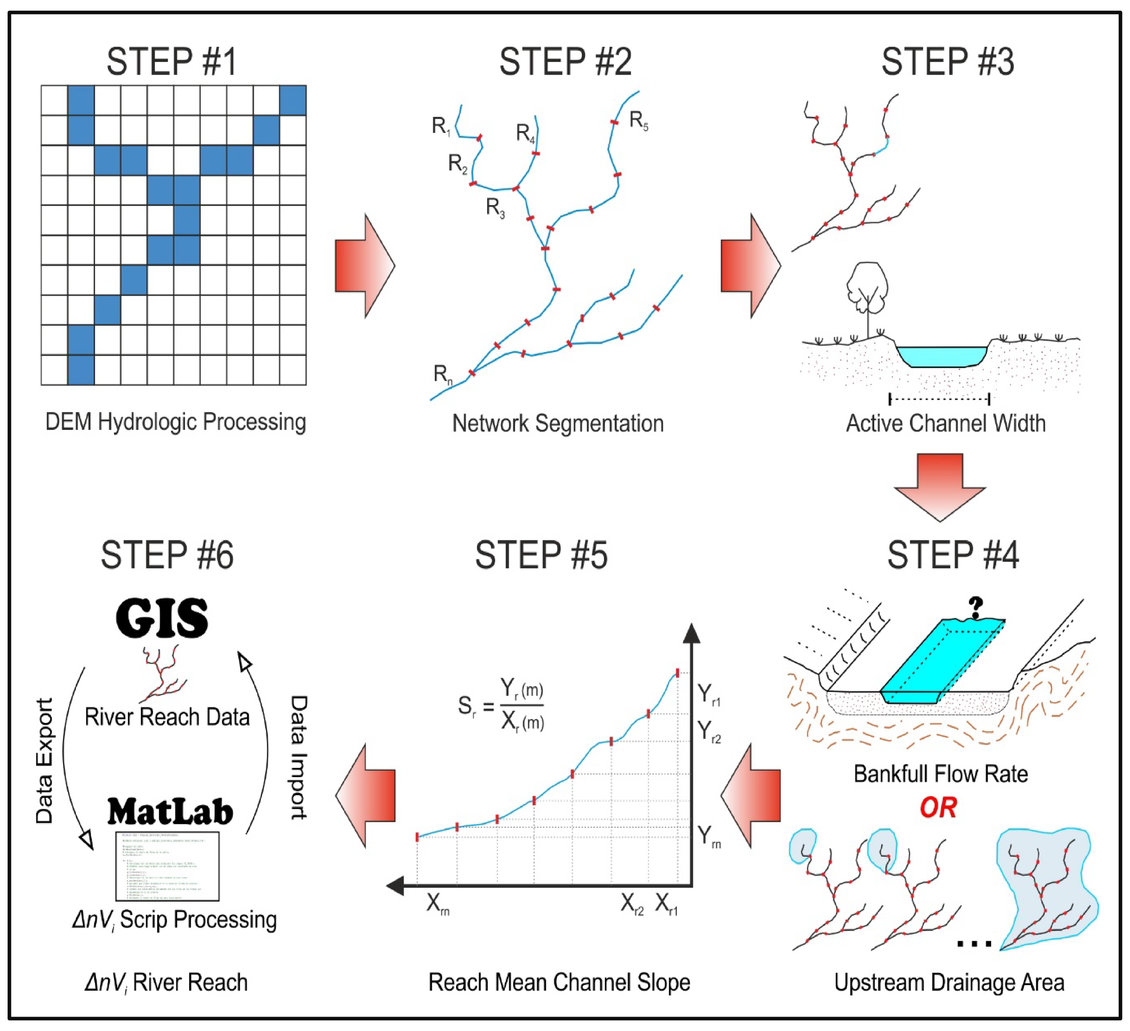
where *D* is the grain size, *S* the bed slope, *Q* the discharge and *B* the active channel width. As a first approximation:

$$D \approx f(S) \quad + \quad Q \approx f(A)$$

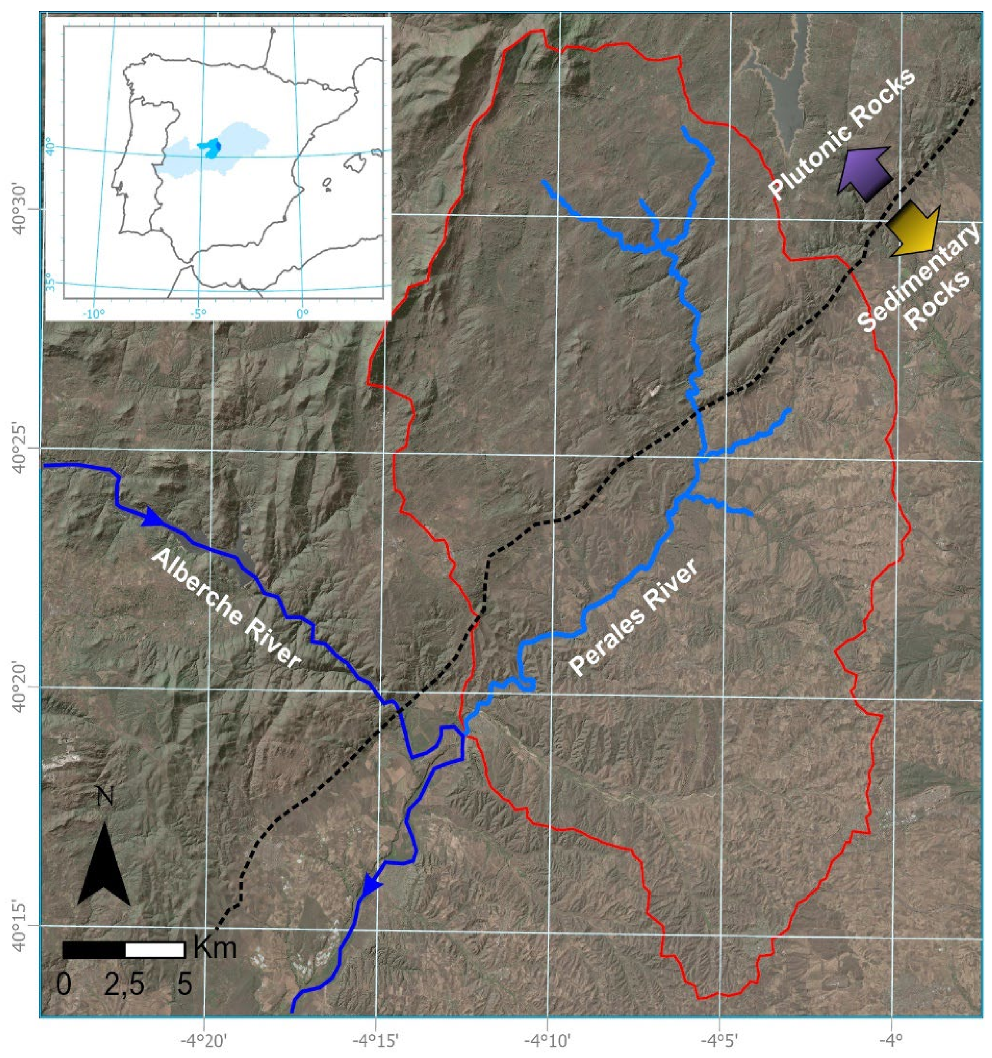
where *A* is the drainage area. Playing with Recking's bedload and Chezy's friction equation, we arrive to an expression that estimates $\Delta nV_i$ in terms of parameters easily mapped using GIS tools:

$$AnV_i = \frac{\left[B^{1.2} Q^{3/5} S^{4.5}\right]_{i-1} - \left[B^{1.2} Q^{3/5} S^{4.5}\right]_i}{min\left(\left[B^{1.2} Q^{3/5} S^{4.5}\right]_{i-1}, \left[B^{1.2} Q^{3/5} S^{4.5}\right]_i\right)}$$

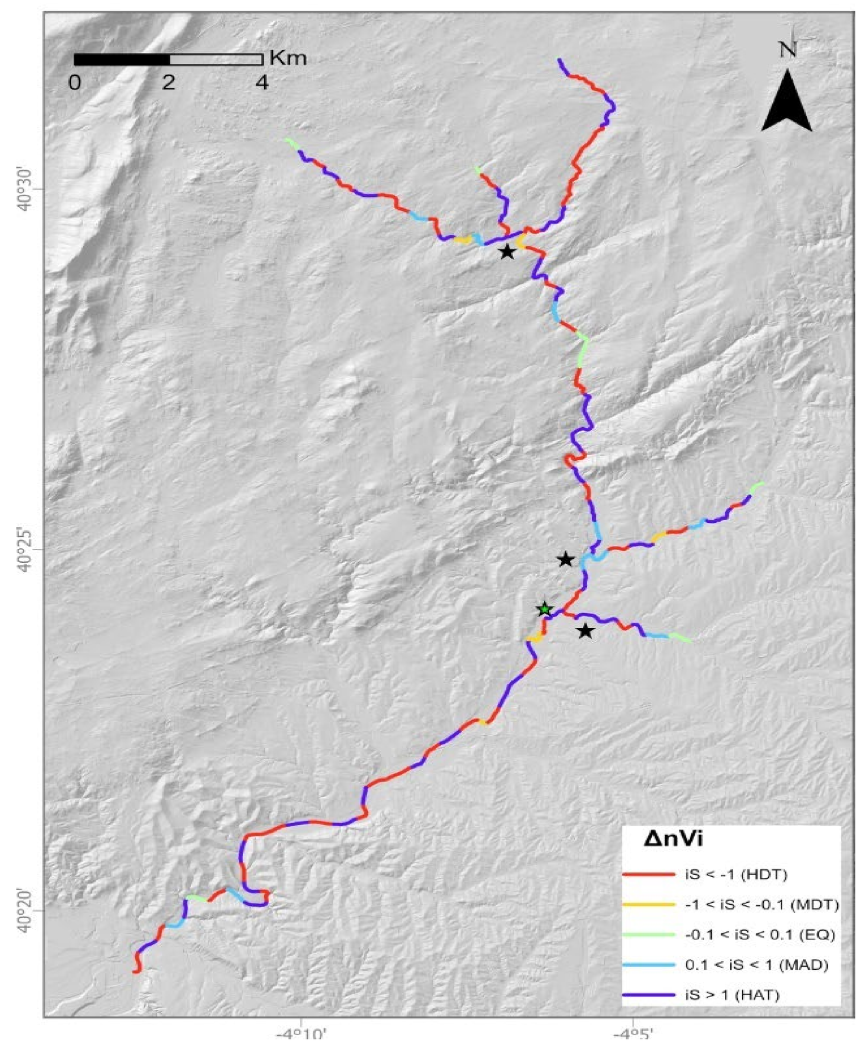
## GIS workflow




## Study site




## Results




## Perspectives

The workflow proposed in this work has allowed us to obtain a synoptic characterisation of the morphosedimentary general conditions of the Perales river basin. The method is simple, relatively quick to apply and relies on sources of information available for many basins around the world.

We are aware of all the limitations inherent in attempting to characterise sediment transport relationships with a 'static' picture, such a map, and without detailed field observations.

However, we believe that such tools could be of great interest to river managers in terms of: 1) giving them a general idea of the state of sediment fluxes in a given basin; and 2) helping them to prioritise and select sectors to focus on for more detailed studies.

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