



Mapping spatial patterns of dimensionless ratios along an ephemeral channel using SfM photogrammetry

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A set of dimensionless morphological ratios are commonly used as a basis for studies of stream stability and natural channel restoration. Often, such ratios have been obtained from morphometric measurements made in the field and developed into a template for a given geomorphic reference site. In this study, high resolution aerial photographs from 2018 and ground-based surveys were used to map the spatial variability of dimensionless ratios (DR) in an ephemeral channel. In particular, three reaches of 0.5-1 km long were chosen along upper Mula stream, in Southeast Spain. Different ratios (width/depth, entrenchment, bank height ratio, root depth/bank height, among other) were estimated from measured channel dimensions, such as bankfull width, maximum and mean bankfull depth, flood prone width, bankfull depth in pools, riffles and runs. Field indicators (the back of point bars, significant breaks in slope, changes in vegetation, the highest scour line or the top of the bank) and a DEM developed from UAV and GNSS data were used to obtain the bankfull stage along each reach. All the data then was transferred to HEC-RAS to obtain the channel profile and cross-sections (separated from each other every 1-5 m). We used a GIS to integrate the high resolution DEM, field measurements and hydraulic geometry data, to calculate the dimensionless ratios and to map the channel reaches. Finally, a statistical analysis of spatial data was performed with R in order to model the morphological relationships for the DR as a function of bed slope and planform parameters.